FLIGHT

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DIARY OF CURRENT AND FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list:—

1932

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Jan. 23. Reunion Dinner of Old Comrades Assoc., R.N., Seaplane Base, Port Said
Jan. 23. Rugby: R.A.F. *v.* Northampton, at Northampton.
Jan. 28. "Effect of Height on Range," Lecture by A. E. Woodward-Nutt and Flt.-Lt. A. F. C. Scroggs, before R.Ae.S.
Jan. 28. "Indoor Flying Models," Lecture by C. H. Barnes, at City and Guilds Eng. College, S. Kensington.
Jan. 28. Rugby: R.A.F. *v.* Leicester, at Leicester.
Jan. 29. Newcastle-on-Tyne Aero Club Annual Dinner and Dance.
Feb. 6. Rugby: R.A.F. *v.* Bedford, at Bedford.
Feb. 10. "Some Aspects of Meteorology in Connection with Gliding and Soaring Flight," Lecture by Capt. F. Entwistle, at City and Guilds Eng. College, S. Kensington.
Feb. 11. Herts and Essex Aero Club Annual Dinner and Dance, Holborn Restaurant.
Feb. 13. Rugby: R.N. *v.* R.A.F., at Twickenham.
Feb. 20. Rugby: R.A.F. *v.* Coventry, at Coventry.
Feb. 22. British Gliding Association. Annual General Meeting.
Feb. 24. "A Flight to Abyssinia," Lecture by Sqdn.-Ldr. J. L. Vachell, before R.U.S.I.
Feb. 24. Rugby: R.A.F. v. United Bank, at Ealing.
Feb. 29. "Flying Boats on Commercial Air Routes," Lecture by C. H. Jackson, at City and Guilds Eng. College, S. Kensington.
Mar. 4. Leicestershire Ae.C. Annual Ball.
Mar. 9. Rugby: R.A.F. *v.* Oxford University, at Oxford.
Mar. 10. "Results with the New Wind Tunnel at N.P.L.," Lecture by E. F. Relf, before R.Ae.S.
Mar. 16. "Development of Naval Air Work," Lecture by Commodore N. F. Laurence, before R.U.S.I.
Mar. 23. "High-Speed Flying," Lecture by Sqdn.-Ldr. A. H. Orlebar, before R.U.S.I.
Mar. 26. Rugby: Army *v.* R.A.F., at Twickenham.
Apr. 2-10. National Aircraft Show, Detroit, U.S.A.
Apr 13. "The North-West Frontier of India," Lecture by Maj.-Gen. S. F. Muspratt, before R.U.S.I.
May 28. London-Newcastle Air Race for "Newcastle Evening World" Trophy.
June 25. R.A.F. Display, Hendon.
July — Circuit of Europe.
Aug. — Circuit of Europe.
Nov. — Paris Aero Show.

EDITORIAL COMMENT

SLOWLY but surely the British airways are reaching out their arms across the Empire. Impatient critics have often declaimed against the slowness of their progress—not the slowness with which the routes are flown, but the slowness with which the routes are opened—and indeed we have been obliged to deplore the slowness of opening a regular service to Karachi, the slowness of opening a regular service to Cape Town, and the slowness of starting a regular service across India. We do not blame any one person or organisation for these delays. To establish a great airway calls for successful co-operation between designers, operators, and more than one Government. It would have been a marvel if the team work had invariably gone without a hitch. That it has not so gone is none the less a misfortune for the British Empire.

The Airway to Cape Town

If hope deferred maketh the heart sick, the fulfilment of that hope is all the sweeter for the delay. On Wednesday, January 20, the first mail bags left Croydon for Capetown and intermediate stations by an aeroplane of Imperial Airways. Inevitably one breathed a sigh of relief "At last!" but the sigh swelled to a cheer of exultation. It was indeed a historic occasion. It was impossible to prevent thoughts from turning to Cecil Rhodes and his great, unfulfilled dream of a railway from Cairo to Cape Town. That dream may never be fulfilled; but if Rhodes were alive to-day would he want it to be fulfilled? The airway, it seems, has made it superfluous, but the airway was not dreamed of in Rhodes' philosophy. For heavy goods which do not call for speed in conveyance there remains the sea with its shipping. For passengers the aeroplane gives greater speed and greater comfort than a railway can ever offer. For mails there will soon,

we hope, be a special service of mail-planes cruising at 150 m.p.h., and ultimately (again, we hope) flying by night as well as by day.

" Farewell, Romance!—and all unseen Romance
brought up the nine fifteen."

So sang Rudyard Kipling, and in truth modern travel has not banished romance. It has merely been clad in new attire. The organised route offers the charm of adventure without discomfort or risk. Wanderers have never ceased to love a road. It was by roads that the Romans spread their civilisation. It was roads which pacified the Highlands after the rebellion of 1745. It is roads which are now mastering the turbulent hills of the North West Frontier of India. Whether man journeys on foot, by stage coach, or by motor car, a road has always made an appeal to the born traveller. The same can be said of a sea voyage, even in the most luxurious liner. A railway, despite Kipling's line, has perhaps gone furthest in divorcing romance from travel ; and yet every traveller can think of stretches of line which bring delight to the eyes and wonder to the soul. There are such railways in the Alps, there are the Himalayan railways up to Simla and Darjeeling, and there are others. Even a journey from London to Edinburgh in the " Royal Scot " is far from prosaic.

An airway surpasses all the other means of travel. The traveller who starts off from suburban Croydon in an Imperial Airways liner will sleep at Athens, at Cairo, Wadi Halfa, Khartum, Juba, Nairobi, M'beya, Salisbury, and Johannesburg. What an experience it sounds to spend a night at Juba and another at M'beya! To go to bed at M'beya could hardly fail to be an adventure. That Thursday which ends at such an unusual and unpronounceable resting place will have begun with a very early start from Nairobi, a breakfast at Moshi, and a lunch at Dodoma. What travellers' tales will be told about the strength of the coffee at Moshi, the chops and tomatoes at Dodoma, and the springs of the beds at M'beya! In time, no doubt, these places where our caravan has rested will be familiar in our mouths as household words—no more outlandish to our ears than Montreux or Ventimiglia—or, for that matter, than Ecclefechan and Bettws-y-Coed. As yet the halting places in Central Africa are still full of the mystery of the unknown, and only the aeroplanes can unveil their realities to our comprehension.

Out of Darkest Africa the air travellers will gradually emerge into civilisation once more. Salisbury has a very homelike sound. After Rhodesia comes the Union of South Africa, the home of test match cricket teams and of Rugby-playing Springboks. The Veldt and the Karoo may be tamer than the forests of equatorial Africa, but they are sights worth seeing ; and when one is in an aeroplane one will not need to gaze at their somewhat austere beauties for too long. The Cape province has charmed all visitors, and Table Mountain is one of the great sights of the British Empire. It may not be so awe-inspiring a sight as the Victoria Falls, or Niagara, or Kinchinjunga seen from Darjeeling, but every home-born Briton who sets eyes on Table Mountain may account himself fortunate. And, when the long but brief journey is ended, it will be an exhilarating thought for the traveller that from the Sudan to the Cape he has never been outside the confines of the British Empire.

From the places traversed our thoughts turn to the aircraft which will traverse them. There is surely all the romance of science in the development of aircraft types. The start from Croydon will be made in a Handley-Page 42. The comforts of that great aeroplane have become widely known, and every air traveller is anxious to sample them. From Paris to Brindisi the journey is made by train (two nights and a day). Then comes the crossing of the Mediterranean in a " Kent " flying boat with four " Jupiter " engines. This boat can lift the same weight as the four-engined landplanes can lift, and its comfort and luxury is quite as elaborate. The passengers will disembark at Alexandria, and once more will take to a train for the short journey to Cairo. Next day they will proceed again by landplane, entering an " Argosy " with three geared " Jaguars." This will take them to Khartum. Then once again they will enter a flying boat, this time a " Calcutta " with three " Jupiters," which will use the Nile and the great lakes as its aerodromes until Kisumu in Kenya is reached. From there on the journey will continue in a " Hercules " landplane with three " Jupiters," down to Cape Town, and it will add to the interest of this section to reflect that the " Hercules " machines have spent years in flying from Cairo to India. In time all these last three types may all be supplanted by the four-engined Armstrong-Whitworth monoplanes which are being built—provided that land aerodromes can be found throughout the route which will bear the weight of a heavy machine in the rainy season. No doubt these will mark a still further advance in comfort. For the present the variety in the types of aircraft will, we fancy, add to the charms of what will be the most wonderful journey in the world.

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The Big Supermarine or the Mail Plane

Everyone will be very disappointed on learning that work has been stopped on the big Supermarine monoplane flying boat with six Rolls-Royce " Buzzard " engines, which was being built for the civil side of the Air Ministry. It would have been interesting to see this boat in operation, and to learn what lessons she could teach. In all probability a boat which would carry 40 passengers and allow some half of them to go to bed would not have been of definite use at the moment on any of the British airways ; but as an experiment the boat would have been welcome. We hope that when times improve work on her will be resumed. However, when economy is necessary we have to do without many things which we should like to have. Everyone knows that the flying boat programme of the Air Ministry has not been abandoned, and there may be other ways, possibly by means of a R.A.F. boat, of learning the lessons which this Supermarine would have taught.

At the moment we are of the opinion that the greatest need of air transport is the special mail-plane ; and recently there was doubt as to whether the Air Ministry would proceed with that. Now we understand that this very necessary machine will certainly be produced. This is excellent news. If the choice actually lay between the mail-plane and a large flying boat, which might not have been of much operational use for the immediate present, we consider that the Air Ministry has been well advised to proceed with the former.

. . . . . *gyrating in gigantic and innumerable vortices, and all whirling . . . .*

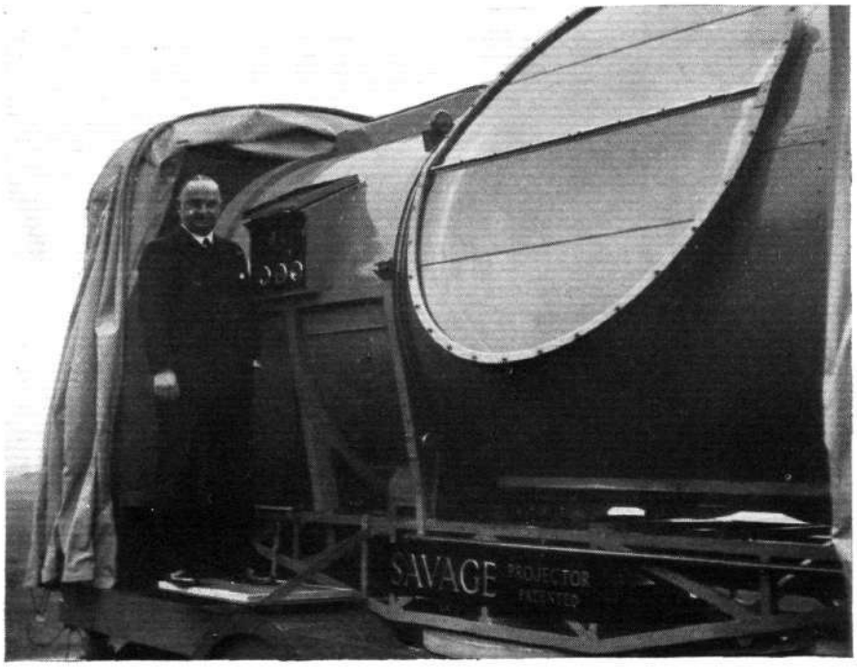
Edgar Allan Poe.

HOW THE CAMERA CAUGHT AN AUTOGIRO AT LOS ANGELES AFTER THE FIRST TRANSCONTINENTAL FLIGHT MADE BY THIS TYPE OF FLYING MACHINE.

The Savage Projector

THOSE in close touch with aeronautical matters have known for many months that the new type of light projector being produced by Maj. Savage would, when the details of it were published, cause quite a stir, not only in aviation circles, but also among the tacticians of the Navy and War Office. That it would be such an advance over existing projectors, as it has turned out to be, was hardly anticipated. Maj. Savage is, however, not the type of man to stand still, and we have little doubt that, revolutionary as it is, the present form of the projector is by no means the last word he will have to say on the matter.

With the question of its use for advertising by projecting the name of a commodity on the clouds we are not greatly concerned. That subject has already proved a Godsend to persons who make a habit of filling the correspondence columns of the general Press. It looks as if it might easily replace the older method of sky-writing by smoke emission if only on the score of weather, and for Naval and Air Defence uses there is not the slightest doubt about its utility.



Major Jack Savage standing at the controls of his Projector. (FLIGHT *Photo.*)

Naturally the apparatus may not be described in detail, but a brief description is now permissible. The model which we were recently privileged to examine was a mobile unit, and it is this type which would appear to have most uses for Air Defence. The unit consists of a Tilling-Stevens petrol-electric chassis upon which is mounted the projector. The engine and generator of this being of sufficient capacity to supply all the current that is necessary both for working the light and for driving the unit. It is thus completely self-contained and highly mobile. The chassis and the generating side of the outfit are standard, and, therefore, need no further description.

The projector is most ingenious in every detail. As will be seen from the illustrations it consists of a barrel, the front end of which contains the source of light, while the rear end is purely the projector. The light is produced by a straightforward automatic arc lamp set in front of a very large parabolic reflector. The lamp, as would be expected, has many detail refinements which, together with the projecting part of the apparatus, accounts for the fact that candle-power available is 3,000,000,000, thus making it undoubtedly the largest projector in the world.

The mirror reflects the rays parallel to the major axis of the barrel and towards the rear where they meet the image-plate, carrying on its face a large number of optical flats. These flats, in turn, alter the course of the light rays through 90 deg. so that they are extruded at right angles to the complete outfit. The flats form one of the most interesting points of the whole projector, for it is through them that the rays may be so emitted as to form a beam of any desired cross-section. Furthermore, the plate has flats on each side and can, by a very ingenious mechanism, be rapidly reversed, thus allowing the use of beams of either of two cross-sections within a short space of time.

Readers will have already realised that the whole secret lies in the ability of this projector to extrude the main beam in a series of parallel rays. Moreover, the degree of divergence of this beam is obtained mechanically without loosing the parallelism of the individual rays. This means that the beam always maintains its maximum intensity and does not suffer through loss of illumination as does a projector where the divergence is obtained by optical means. Actually the total loss of light does not amount to 7 per cent., while, due to their parallel nature, the rays give a far greater range than is normally obtained.

The barrel is mounted on roller bearings and may readily be trained by electrical means. In a similar fashion the projection end of the barrel may be rotated for elevation. The light can thus be directed at any desired spot. Due to the careful mounting of both parts of the barrel, the power required to turn them is very small indeed, and is

On the left is the remote control box by means of which the beam may be turned in any direction. On the right it will be seen that the barrel comprising the lamp and projector has been trained round. (FLIGHT *Photos.*)

actually accomplished through small electric drill motors set so that they drive a friction pad in the form of a canvas-rubber roller, this roller generally working on a strip of simple ribbed aluminium motor-car footboard beading. These small motors are controlled by a four-way remote switch allowing of infinitely variable speeds, which permits the projector to be trained and elevated at the same time if required.

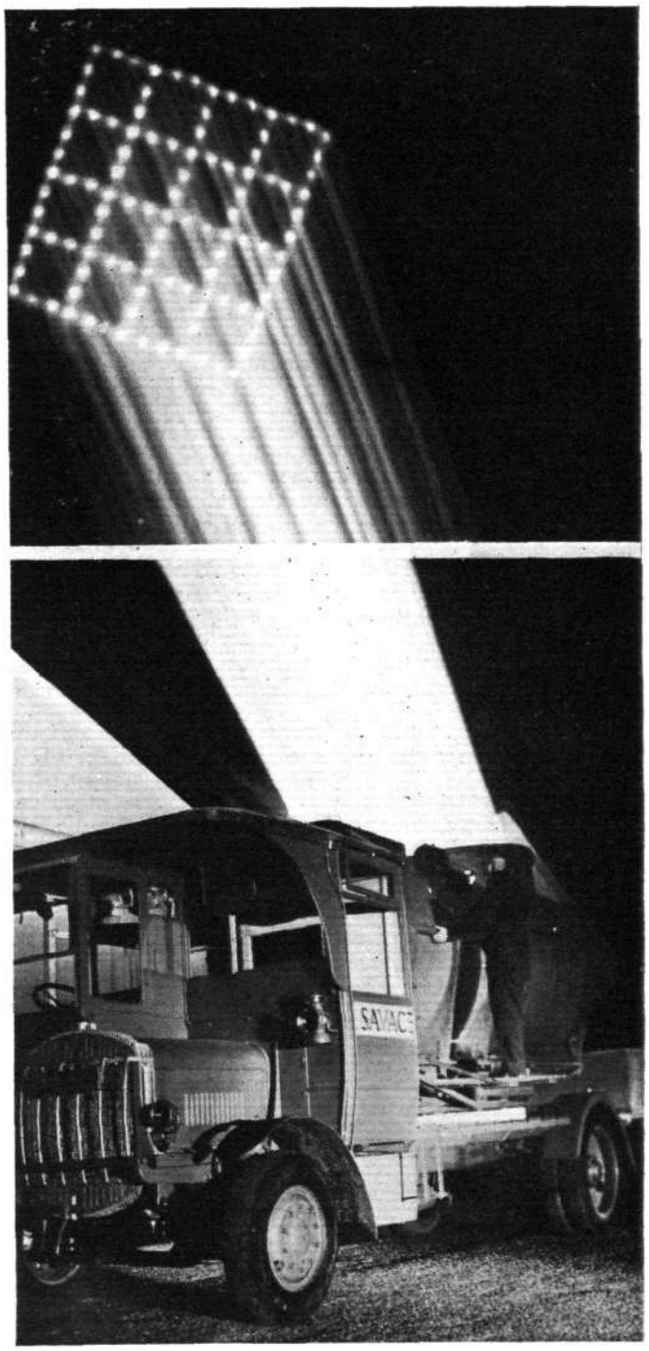
The first application, which has already been widely discussed, is for finding the speed, height and direction of flight, of enemy aircraft. For this the image plate is so arranged that the beam projected is of honeycomb cross-section. If there is a cloud ceiling then the result is as shown in our photograph. Now, present-day sound-detection methods already give a directional accuracy of 5 deg., but the Savage Projector can produce this grid of a size which subtends an angle of 20 deg. across the flats and 28 deg. across the corners. It stands to reason, therefore, that it is comparatively simple to lay the beam so as to straddle the enemy before it is switched on. When switched on as shown—the grid may be one of only nine squares or of a completely different shape if desired—the aircraft is bound to fly into sight across one of the lines, and by a fairly simple method it is possible to find its height, speed and direction, as soon as it has crossed three of them. These data having been given to the commander of the anti-aircraft battery, it is only the work of a second to pull a lever which concentrates all the rays into a central square, thus permitting the beam to be used for gunnery in the ordinary way. Conversely, should the aircraft try to spin out of the beam, the grid may instantly be opened again, and such is its size that it will be almost impossible for the pilot the get clear of it before he again crosses one of its lines.

A further application for aviation use is that of landing light. Pilots who have used it in this form have told us that any other flood light looks like a wax-candle light when compared to the Savage Projector. It has the great advantage that the beam may be as little as 5 ft. 6 in. deep, and therefore illuminates the ground only, without being so high as to dazzle the pilot in any way. When used for this purpose the present model can give this flat beam, of parallel rays of course, with a spread of 60 deg., and as the outfit is mobile it is quite easy to manœuvre it into the best position on the aerodrome.

As a recall signal for aircraft flying at night it is capable of being set so that the rays of the beam act as a code. For example, it may be directed vertically with the rays going out fan shaped. Previously, the normal searchlight has been used for this purpose, but this kind of signal lends itself all too easily to being copied by the enemy.

It has also been found that owing to the heavy loading of infra-red rays which the beam contains, it is extremely good for piercing fog. The beam will go right up through a fog bank and act as a signal to aircraft above, showing where the aerodrome is, but so far the damping effect of the fog has not been overcome sufficiently to provide enough illumination for actual landings.

For Naval use the Savage Projector is equally revolutionary. Firstly, because, as already explained, horizontal divergence of the beam can be obtained mechanically, thus saving the enormous loss of illumination which occurs with optical divergence. For picking up an enemy at sea it is obviously best to have a wide beam, and if this can be had without loss of power then the proposition becomes worth examining. As at present arranged this projector gives an angular spread of 60 deg., with maximum illumination. A ship which therefore had six such projectors could at any given moment completely illuminate the whole horizon, and, moreover, as the rays are parallel, every object at every point all round the horizon would be blinded. Think what that means ; no searching for the enemy ships; no constant traversing the searchlights in order to keep on the target; no elaborate control system for the searchlights, just fixed lights which would be on or off, though, naturally, other arrangements would have to be made for dealing with aircraft attacks. Definite bearings could, however, be allotted to each projector for surface work which would ensure immediate and complete illumination.



A composite view showing the Projector in action. In this case the design coming from the image plate is a 16 square grid, of the kind suitable for aircraft defence.

The whole unit was, as mentioned at the beginning, evolved during research for a process which would replace skywriting and overcome its inherent drawbacks, namely, weather and darkness. The number of days really suitable for skywriting in England are very few, but the number of nights when this type of projector could be used are innumerable ; furthermore, skywriting only produces something which can be read for a few minutes. In conclusion, therefore, we may truthfully say that the Projector scores on almost all counts.

Death of Louis Brennan

WE regret to announce the death, at the age of 79, of Mr. Louis Brennan, C.B., the inventor of the torpedo, monorail and helicopter bearing his name. His helicopter was tested by the Air Ministry at Farnborough some years ago.

Death of Sir Herbert Hambling

SIR HERBERT HAMBLING, deputy Chairman of Barclays Bank, who was chairman of the Civil Aviation Subsidies Committee (known as the Hambling Committee) in 1923, died suddenly in his country home, Rookery Park, Roxford, Suffolk, on January 19.

Ground Speed and Course Correction

WE have received from Mr. A. W. Berry, of the Meteorological Office at Lympne Airport, Kent, a set of tables from which a pilot can, knowing his true course from the map, and the wind direction, work out the course to steer and the ground speed. As it is thought that the tables will prove useful to private owners on cross-country flights, we have reproduced them below.

Mr. Berry has compiled his tables on the assumption that the pilot of the aircraft knows his air speed, and that this is 90 m.p.h., 100 m.p.h., 110 m.p.h., or 120 m.p.h. Obviously for machines with still-air cruising speeds which fall between any two of these figures the pilot will have to "guess" at his corrections and ground speed. That is a drawback of all tables of this sort. Intermediate figures have to be estimated whereas on a set of curves they could be read off direct. However, in many ways tables are preferable to curves for use on board an aircraft, and with a little practice it should not be very difficult for a pilot to make a fairly accurate estimate even if his air speed is not exactly that shown on one of the four tables.

In this connection it might, perhaps, be pointed out that the tables can be used for fractions and multiples of the given air speeds. For example, for an air speed of 200 m.p.h. (there are not *very* large numbers of private owners' machines cruising at that speed yet—ED.) and a wind velocity of 40 m.p.h., the appropriate figures would be given in the table for air speed 100 m.p.h. under wind velocity 20 m.p.h.

Mr. Berry calls the angle which the wind direction makes with the map course "Wind Deviation." This angle is, of course, obtained by subtracting the map course (in degrees) from the wind direction. *If the wind direction (in degrees) should be smaller than the map course (also in degrees), 360 degrees must be added to the wind direction.*

EXPLANATION: In the Tables published below, "Wind Deviation" is map course (in degrees) subtracted from wind direction. When wind direction is less than angle of course, add 360 degrees to wind direction.

G.S. is ground speed in m.p.h. C. to C. (Correction to Course) is the angle (positive or negative) which must be applied to the course angle in order to obtain the course to steer under the conditions obtaining

In the tables, in the columns headed "C to C" (Correction to Course), all *negative* figures are shown in bold type to make them distinct and avoid confusion and errors.

Examples:

An aircraft with a still-air cruising speed of 90 m.p.h. is flying to a destination the map course to which is 120 deg. The wind direction is 240 deg., and the wind speed 30 m.p.h. Then "Wind Deviation = 240 deg. − 120 deg. = 120 deg. From the table corresponding to air speed 90 m.p.h. the ground speed (G.S.) is then found to be 101 m.p.h., and the C. to C. (Correction to Course) 17 deg. The course to steer is therefore 120 deg. + 17 deg. = 137 deg. To this must be added the magnetic variation.

Another case, in which the wind direction is smaller than the map course, and in which, therefore, 360 deg. must be added to the wind direction:

Air speed, 100 m.p.h.; course from map, 245 deg.;

AIR SPEED 90 M.P.H.

Wind Speed.	10 m.p.h.		20 m.p.h.		30 m.p.h.		40 m.p.h.		50 m.p.h.	
Wind Deviation.	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C
Deg.		Deg.		Deg.		Deg.		Deg.		Deg.
15	81	+ 2	71	+ 4	61	+ 5	51	+ 7	41	+ 8
30	82	4	73	7	63	10	53	13	43	16
45	83	5	75	9	67	14	58	18	48	23
60	85	6	78	11	71	17	63	23	54	29
75	87	7	83	13	78	19	72	25	63	33
90	89	7	88	14	85	20	81	27	75	34
105	92	7	93	13	93	19	91	25	88	33
120	95	6	98	11	101	17	103	23	104	29
135	97	5	104	9	109	14	114	18	118	23
150	98	4	107	7	115	10	122	13	129	16
165	99	2	109	4	118	5	127	7	137	8
180	100	0	110	0	120	0	130	0	140	0
195	99	**− 2**	109	**− 4**	118	**− 5**	127	**− 7**	137	**− 8**
210	98	**4**	107	**7**	115	**10**	122	**13**	129	**16**
225	97	**5**	104	**9**	109	**14**	114	**18**	118	**23**
240	95	**6**	98	**11**	101	**17**	103	**23**	104	**29**
255	92	**7**	93	**13**	93	**19**	91	**25**	88	**33**
270	89	**7**	88	**14**	85	**20**	81	**27**	75	**34**
285	87	**7**	83	**13**	78	**19**	72	**25**	63	**33**
300	85	**6**	78	**11**	71	**17**	63	**23**	54	**29**
315	83	**5**	75	**9**	67	**14**	58	**18**	48	**23**
330	82	**4**	73	**7**	63	**10**	53	**13**	43	**16**
345	81	**2**	71	**4**	61	**5**	51	**7**	41	**8**
360	80	**0**	70	**0**	60	**0**	50	**0**	40	**0**

AIR SPEED 100 M.P.H.

Wind Speed.	10 m.p.h.		20 m.p.h.		30 m.p.h.		40 m.p.h.		50 m.p.h.	
Wind Deviation.	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C
Deg.		Deg.		Deg.		Deg.		Deg.		Deg.
15	91	+ 1	81	+ 3	71	+ 5	61	+ 6	52	+ 7
30	92	3	83	6	73	9	64	12	54	15
45	93	4	85	8	77	12	68	17	59	21
60	95	5	89	10	82	15	74	20	65	25
75	97	6	93	11	89	17	82	23	75	29
90	99	6	98	11	95	17	92	24	87	30
105	102	6	103	11	103	17	102	24	99	29
120	105	5	109	10	112	15	114	20	115	26
135	107	4	113	8	119	12	124	17	129	21
150	108	3	116	6	125	9	132	12	140	15
165	109	1	118	3	128	5	138	6	147	7
180	110	0	120	0	130	0	140	0	150	0
195	109	**− 1**	118	**− 3**	128	**− 5**	138	**− 6**	147	**− 7**
210	108	**3**	116	**6**	125	**9**	132	**12**	140	**15**
225	107	**4**	113	**8**	119	**12**	124	**17**	129	**21**
240	105	**5**	109	**10**	112	**15**	114	**20**	115	**26**
255	102	**6**	103	**11**	103	**17**	102	**24**	99	**29**
270	99	**6**	98	**11**	95	**17**	92	**24**	87	**30**
285	97	**6**	93	**11**	89	**17**	82	**23**	75	**29**
300	95	**5**	89	**10**	82	**15**	74	**20**	65	**25**
315	93	**4**	86	**8**	77	**12**	68	**17**	59	**21**
330	92	**3**	83	**6**	73	**9**	64	**12**	54	**15**
345	91	**1**	81	**3**	71	**5**	61	**6**	52	**7**
360	90	**0**	80	**0**	70	**0**	60	**0**	50	**0**

AIR SPEED 110 M.P.H.

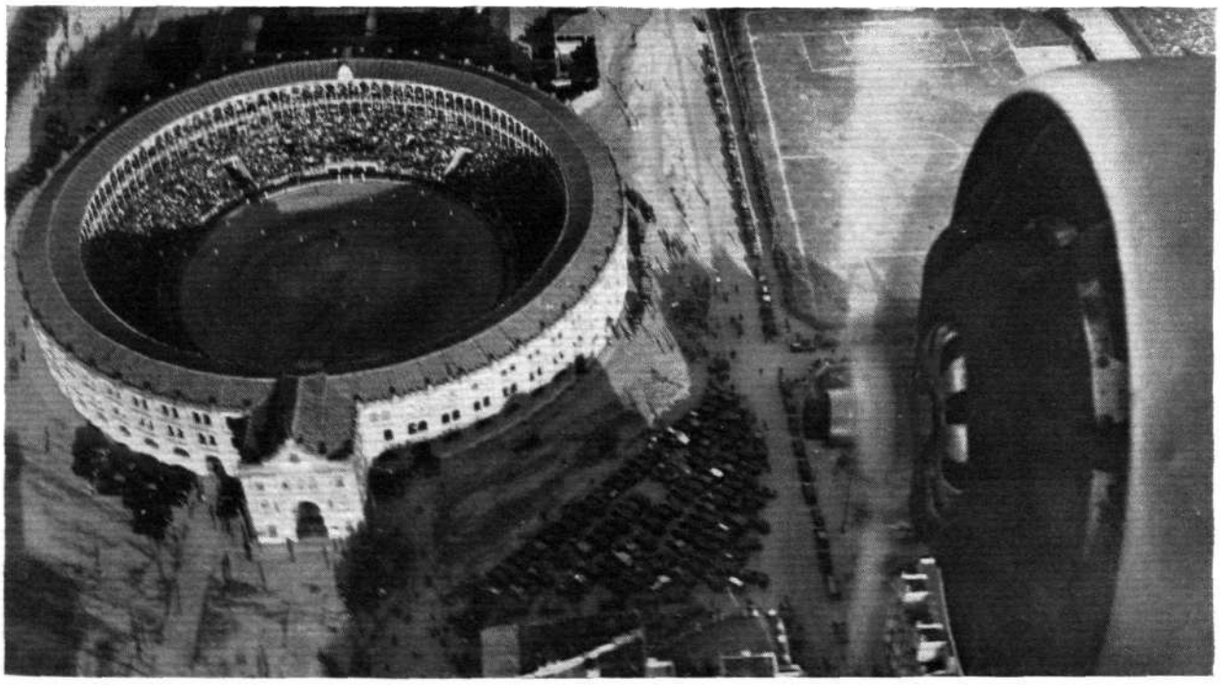
Wind Speed.	10 m.p.h.		20 m.p.h.		30 m.p.h.		40 m.p.h.		50 m.p.h.	
Wind Deviation.	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C-to C
Deg. 15	101	Deg. + 1	91	Deg. + 3	81	Deg. + 4	71	Deg. + 5	61	Deg. + 7
30	102	3	93	6	84	8	74	11	64	13
45	103	4	95	8	87	11	78	15	69	19
60	105	5	98	9	92	14	84	18	76	23
75	107	5	103	10	98	15	93	21	87	26
90	109	6	108	11	106	16	102	22	98	27
105	112	5	113	10	113	15	113	21	111	26
120	115	5	119	9	121	14	125	18	126	23
135	117	4	123	8	129	11	135	15	139	19
150	118	3	126	6	134	8	143	11	150	13
165	119	1	128	3	138	4	148	5	157	7
180	120	0	130	0	140	0	150	0	160	0
195	119	− 1	128	− 3	138	− 4	148	− 5	157	− 7
210	118	3	126	6	134	8	143	11	150	13
225	117	4	123	8	129	11	135	15	139	19
240	115	5	119	9	121	14	125	18	126	23
255	112	5	113	10	113	15	113	21	111	26
270	109	6	108	11	106	16	102	22	98	27
285	107	5	103	10	98	15	93	21	87	26
300	105	5	98	9	92	14	84	18	76	23
315	103	4	95	8	87	11	78	15	69	19
330	102	3	93	6	84	8	74	11	64	13
345	101	1	91	3	81	4	71	5	61	7
360	100	0	90	0	80	0	70	0	60	0

AIR SPEED 120 M.P.H.

Wind Speed.	10 m.p.h.		20 m.p.h.		30 m.p.h.		40 m.p.h.		50 m.p.h.	
Wind Deviation.	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C	G.S.	C to C
Deg. 15	111	Deg. + 1	101	Deg. + 3	91	Deg. + 4	82	Deg. + 5	72	Deg. + 6
30	111	3	103	5	94	8	84	10	75	12
45	113	4	105	7	98	10	89	14	80	17
60	115	4	109	8	102	12	95	17	87	21
75	117	5	115	9	109	14	103	19	97	24
90	119	5	118	10	117	15	113	20	109	25
105	122	5	123	9	124	14	123	19	122	24
120	125	4	129	8	132	12	135	17	137	21
135	127	4	133	7	140	10	145	14	150	17
150	128	3	137	5	145	8	153	10	161	12
165	129	1	139	3	149	4	158	5	168	6
180	130	0	140	0	150	0	160	0	170	0
195	129	− 1	139	− 3	149	− 4	158	− 5	168	− 6
210	128	3	137	5	145	8	153	10	161	12
225	127	4	133	7	140	10	145	14	150	17
240	125	4	129	8	132	12	135	17	137	21
255	122	5	123	9	124	14	123	19	122	24
270	119	5	118	10	117	15	113	20	109	25
285	117	5	115	9	109	14	103	19	97	24
300	115	4	109	8	102	12	95	17	87	21
315	113	4	105	7	98	10	89	14	80	17
330	111	3	103	5	94	8	84	10	75	12
345	111	1	101	3	91	4	81	5	72	6
360	110	0	100	0	90	0	80	0	70	0

wind direction, 140 deg.; wind speed, 40 m.p.h.; "Wind Deviation" = 140 deg. + 360 deg. − 245 deg. = 255 deg. From the table relating to air speeds of 100 m.p.h., opposite 255 deg. and under 40 m.p.h., is found ground speed (G.S.) 102 m.p.h. and C. to C. (Correction to Course) *minus* 24 deg. The course to steer is, therefore, 245 deg. − 24 deg. = 221 deg. (*plus* the magnetic variation of the district in which the flight is being made).

We could have wished that Mr. Berry had used as a basis for his tables magnetic instead of true bearings, but the necessary correction is not, of course, a difficult one to make.



AN OLD SPANISH CUSTOM FROM THE AIR: A fine aerial view of the Madrid Bull Ring and adjacent football ground taken from a three-engined Ford monoplane supplied to the Spanish Government. The car park is clearly visible in the foreground and the propeller and nose of the plane can be seen on the right.

AVIATION FACILITIES IN ITALY

DURING the last few months we have from time to time published maps giving the aerodromes in foreign countries at which facilities were provided for those making aerial tours. Above we are offering one, with all the most important Italian aerodromes and landing grounds on it. Italy provides a touring ground of immense scope, a ground which will ensure that the traveller by air has a very large variety of scenery, and, although many have found that petty hindrances are placed in their way, yet those who assure themselves before their start that their papers are in order, need have no fear of other than a very pleasant tour.

It will be seen from the map, which has so well been compiled by the Aviation Department of the Automobile Association, that all the aerodromes are classified and that the prohibited areas are marked. This map should therefore provide a basis upon which a tour of any size may well be laid out.

Private Flying & Gliding

BROOKLANDS WEEKLY NOTES

During the last week there have only been five flying days, but, despite this, the School has put in 35 hr. 10 min. instructional flying.

Mr. J. H. Howse made a very successful first solo flight, and Mr. G. I. Pawson, a 17-year-old Haileybury schoolboy, is almost ready to be launched off on his first solo.

Mr. R. Richards, the latest private owner, returned from his first long cross-country flight to Florence on Sunday ; he arrived at Brooklands in a howling gale and heavy rain, but seemed none the worse for his experience.

The instructional staff are at present concentrating on blind flying, and it is hoped we shall be able to announce in the course of the next week or so that a very reasonable course of instruction can be obtained in instrument flying.

The Brooklands Aero Club is holding a conference on Tuesday next, when the subject of the Brooklands Pilots' Club and the programme for this year will be discussed. It is hoped that it will be possible to make an interesting announcement in next week's issue.

Mr. Gilbert Wright, who is a member of the School, has for the last 18 months been working on a revolutionary type of aero engine. We are informed that the engine has come entirely up to expectations, and will be going to Farnborough in the near future.

The new Brooklands-Lympne merger seems to be working exceptionally well. A combination of the School and Cinque Ports Flying Club should be a double attraction to new members. Economies in all departments at Lympne have been effected, and the financial budget has balanced.

READING NOTES

In spite of the bad weather Phillips & Powis, of Reading, have been able to maintain a very fair amount of flying, a number of new pupils having joined the School, among whom is Pat Dunphy, a schoolboy, age 15.

The Sales and Repair departments are exceedingly busy, quite a large number of private owners bringing in their machines for C. of A.

TAKERS OF THE SILK: Miss Hazel Wootton and Parnell, who recently jumped at Reading Aerodrome with Russell Lobe Parachutes

UNDER THE HOOD: Major Travers is shown just about to take off with our representative (under the hood) for a trial flight of the blind flying equipment used by the London Aeroplane Club. The only additional instrument fitted is the latest form of P. B. Deviator (described in "Flight" for February 27, 1931) and has proved itself easy to follow, though somewhat more sluggish than many of its competitors. Several members have already taken the course of instrument flying. (FLIGHT *Photo.*)

The latest additional facilities offered to pupils and club members is a parachute school. In conjunction with the British Russell Parachute Co., Ltd., instruction is given to pupils, and five have already made live drops. The most interesting jump has been that of 15-year-old Miss Hazel Wootton, who made her drop with a static line, from a "Klemm" ; at the same time a photographer jumped with his camera from a 3-seater "Spartan" to take a cinematograph of her descent ; we believe this is the first time this has been done, it was a most interesting spectacle to see both parachutists floating down in perfect formation, and carrying on a conversation during their descent.

PORTSMOUTH AND SOUTHSEA GLIDING CLUB

For the information of prospective members and old members who have not been along for some time, the Club has now in use a means for hauling the glider to the top of the hill with very little effort and in much quicker time. A pulley and a long length of wire are used and the necessary energy is supplied by a motor car, or a small team if it is not practicable for a car. Portsdown Hill is suited to this method and the apparatus can be moved to any spot. The glider has, of course, to be brought on the trailer to the bottom first, but this entails comparatively little work.

A very successful day's flying was carried out on Sunday, January 17, the wind and weather generally being fine all day. There was a large number of interested spectators and a score or so of cars parked along the hill-top. Numerous lengthy flights were made and one more "B" certificate was qualified for—this time by Mr. R. Yates.

Anybody interested in joining the Club should write to the Hon. Sec., V. R. Yelf, 14, Middle Street, Portsmouth.

NEWCASTLE-UPON-TYNE

A race from London to Newcastle, it has been announced, will be run for the *Evening World* Trophy on similar lines to that which was held last year. The provisional date fixed for this race is Saturday, May 28. Further particulars will be issued shortly. The annual dinner and dance of the club is being held at Tilleys, Barras Bridge Assembly Rooms, Newcastle-upon-Tyne, on Friday, January 29, tickets for which can be obtained by applying to the Secretary, Cramlington Aerodrome, Northumberland.

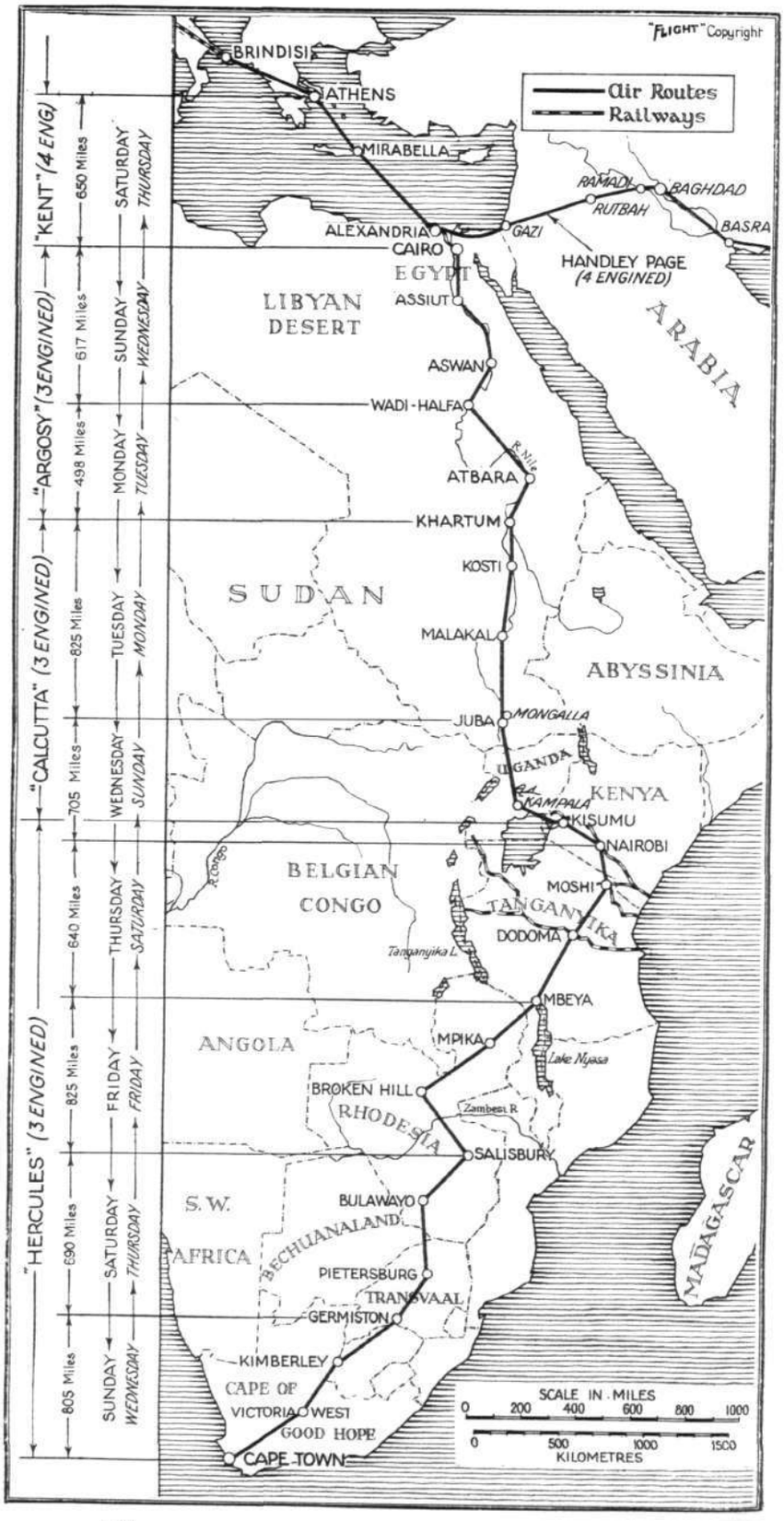
Air Transport

London—Cape Town

On Wednesday, Jan. 20, the first load of mails left Croydon for Cape Town and intermediate stations by Imperial Airways service. Our two maps show the route which will be followed, the stages for each day and the types of aircraft used on each section

(*FLIGHT Photos*)

FOUR types of aircraft as well as the train will be used to convey mails and, before long, passengers from Croydon to Capetown. The start each week will be made on a Wednesday, both from Croydon and from Capetown. The journey in either direction comes to an end on the Sunday week. The greater part of 12 days will be spent on the trip. Two nights will be spent in the train, namely, those between Paris and Brindisi, and every other night will be spent in a hotel or rest house. The stopping places are the same for the southward



and northward journeys, except that south-bound passengers, on landing at Alexandria from the "Kent" flying boat, go on to Cairo by the evening train, arriving at 10.15 p.m., and spend the night there. North-bound travellers do not stop for the night at Cairo, but go on by train to Alexandria for the night, so as to be ready for a start in the flying boat at 7 a.m. next morning. Early starts are the order of the day, but in a hot climate this is no hardship. In the equatorial parts of Africa, and especially where the aerodromes lie at an altitude of some thousands of feet above sea level, the cool morning air very greatly assists an aeroplane to get off without an unduly long run. The aircraft used by Imperial Airways all have plenty of power, for they all have at least three engines, but none the less a start in the cool of the morning is very desirable. The earliest start is at 5 a.m. from Khartum, and the usual hour is 6 a.m.; but on some mornings the start will be as late as 8 a.m. Wadi Halfa and M'beya are the two halting places where passengers will be allowed this luxury.

THE CONNECTING LINK: A Junkers machine of South West African Airways at Windhoek. Connection is made with Imperial Airways at Kimberley.

The maps which we publish show very clearly the route, and the stages for each day, both on the outward and the homeward journeys. They also give, as nearly as possible, the number of miles which will be flown each day. The type of aircraft used on each stage is likewise indicated, and we publish small photographs of the five types which will be used. The Handley Page 42 (European model) is provided with seats for 38 passengers, but it is not expected that in the early days, at any rate, 38 people will all want to fly to Capetown on the same day. If that were to happen, the services south of Brindisi would have to be trebled, for the "Kent" flying boats only accommodate 16 passengers. Having the same engine power as the Handley Pages, the "Kents" will lift an equal weight; but they have only been provided with 16 seats, as it is expected (and doubtless correctly) that in the early days of the service the weight of mails will exceed the weight of the passengers.

Airways, if laid out with due forethought, have the capacity to create their own traffic. There is rarely a rush for seats in the early days of a new service. The world is not yet sufficiently air-minded for that. Confidence is gradually created by punctual arrivals and departures over a period of time. Then people who are not inclined to risk their necks in the air will venture to send a letter by aeroplane, and are duly encouraged when it arrives safely and at a speed which surface transport cannot rival. The next stage in the growth of confidence is a trip by a man or woman who is in such a hurry that he or she is inclined to take risks, and few who venture into the air are not so charmed by the experience that they do not want to fly again. In this way traffic is built up.

Imperial Airways are obliged to be ever looking ahead. The machines which they order must always be an advance on the requirements of the moment. At present they do not expect the Handley Page machines and the "Kents" to be loaded up to their full capacity with passengers and goods for South Africa. These machines will have to remain in service for several years, and before they become obsolete their capacity may well become insufficient. Older machines of well-proved qualities will be used on the stages south of Cairo, the "Argosy," the "Calcutta," and the "Hercules." The amount of pay load which they will carry is less than that of the Handley Page landplanes and the "Kents." For the present it will doubtless be amply sufficient, but already Imperial Airways have looked ahead and provided for an increase of traffic. They have placed an order with Armstrong-Whitworths for a number of four-engined monoplanes of greater capacity and speed. When these have been delivered they may supplant all the three types now in use between Cairo and Captown. It will certainly be an advantage for the operating company to reduce the number of types which it uses, and in particular to use only one type of engine. Whether it will be possible to use landplanes over the whole of the African route remains to be seen. At present landplanes cannot be used on the section between Khartum and Kisumu, in Kenya, all the year round, because the aerodromes get so water-logged in the rainy season that they cannot bear the weight of a heavy landplane. The solution has been to use "Calcutta" flying boats, and to take off from and alight on the Nile and the lakes. Search is being made for sites where aerodromes may be located which will be usable all the year round. One such site has been found at Juba, and perhaps others will be found. An attempt is to be made shortly to fly the "Argosy" machines through the Sudan, Uganda, into Kenya, but the "Calcutta" boats will be at hand in case they are wanted.

The service opens with a cargo of mails only. Passengers will be carried before long. In due course special mail-planes will be tried out on this route, and the capacious aircraft will be reserved for passengers only. The pleasure to be derived from a journey along such an airway must be at least as great as can be derived from any other journey, whatever the destination. The use of such an airway to the Empire is bound to grow greater in each succeeding year. That it should be in active existence is a fact of absolutely first-rate importance.

The Australian Xmas Air Mail

AIR COMM. KINGSFORD SMITH, who left Hamble on January 7 in the Avro 10 *Southern Star* with the much delayed Christmas air mail for Australia, arrived at Port Darwin on January 19 at 1.45 p.m. (4.45 a.m. G.M.T.), having accomplished the journey in just under 12½ days—a record for commercial machines. But for some delay, owing to fog, at Kupang, he would have reduced still further the record for a commercial machine he set up for the same trip (13 days) in 1919. Kingsford Smith's log for the journey was as follows:—January 7, Marseilles; January 8, Rome; January 9, Athens; January 10, Aleppo; January 12, over Karachi; January 13, Calcutta; January 15, Singapore; January 16, Sourabaya; January 18, Kupang; January 19, Port Darwin.

Delhi "Moth" Carries the Mail

SINCE the termination of the contract between Imperial Airways and the Indian Government for the carriage of mails between Karachi and Delhi, the work has been entrusted to the Delhi Flying Club, which ordered a new "Moth" for this work. The first flight under this new arrangement was made on January 5-6, and the machine arrived at Karachi in time to catch the homebound Imperial Airways machine which left at 9.30 a.m. The pilot of the "Moth" was an Indian member of the club, a Mr. Sharma.

"Puss Moths" in Siam

OPERATING with four de Havilland "Puss Moths," The Aerial Transport Company of Siam have recently published some figures which speak volumes for the reliability and efficiency of these machines. During the three months August, September and October, these four aeroplanes carried 3,391,719 kilograms of mail, 528,024 kilograms of goods, 22 passengers, and altogether covered 20,840 kilometres. Not once during this period did any of these machines give the slighest vestige of trouble, and the prearranged flying schedule was carried through from start to finish with but one delay—a 24 hours' stop at Korat, due to bad weather.

Airport News

CROYDON

GALES and rain have held sway at Croydon for the greater part of last week, and the aerodrome surface has been sorely tried with the amount of water, but in spite of it all there has been no signs of aircraft getting bogged, and, considering the traffic and size of machines that operate from here, it goes to prove that, in spite of the cries of some, the surface here has a lot to recommend it. I know many aerodromes where it would have been disastrous to try and make a landing after the amount of water that has fallen here during the week. Speaking of bogging, our good friend Mr. Olley has been bogged at Macon, in France, since Monday last, where he had to land whilst flying home from Cairo. His passenger, however, was not delayed, for he travelled to Paris by train and caught the 8.30 Imperial from there on Tuesday morning, thus arriving in London before his actual expected time. It was all a very fine effort, but at the same time hard luck on Mr. Olley that he himself should be robbed of the glory of bringing his passenger right home. He has the satisfaction, however, of knowing that no time was lost through his bad luck.

Miss Peggy Salaman travelled to Paris on Tuesday by the 12.30 Imperial.

On Thursday, the Prince of Ethiopia visited us, and showed very keen interest in all he saw. He was offered a flight in "Helena," the last H.P.42, but I understand he was not allowed to accept, so the machine was flown and demonstrated while he stood by an interested spectator. No special displays were arranged for him as has been the case in the past; he simply saw the aerodrome under normal everyday working conditions. Col. Shelmerdine represented the Air Ministry, and was fully occupied explaining points to the Prince.

There are very persistent rumours about on the aerodrome that there is likely to be an agreement between the Air Union and Imperial Airways during the coming summer. Instead of running in competition with each other, rumour has it that they are contemplating running in conjunction, and splitting the services between them, and increasing the services also. Let it be clearly understood this is only rumour, but, as I have said, it is a very persistent one, and everybody seems to have heard it, so there may be a great deal in it. However, we shall see in due course. The aerodrome police are being equipped with a new-style uniform, and it must be recorded that it is a distinct improvement on the old one; they really look quite smart and more like policemen, although actually I believe they are called wardens officially. I have heard them called by other names as well.

The weather has been rather against joyriding and school work this week, although every fine period has been taken full advantage of. Several night flights for "B" licences were attempted.

The traffic figures for the week were:—Passengers, 408; freight, 30 tons.

P. B.

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NOTES ON THE WEATHER OF 1931

THE Meteorological Office, Air Ministry, has issued the following notes on the weather of 1931:—

Broadly speaking, the weather of 1931 may be described as wet and dull. In particular the summer was most unseasonable, with no appreciable warm spell, a large deficiency of sunshine and frequent heavy rains. January was sunny, particularly in places unaffected by the fog of the first eight days, while February was characterised by squally west or north-west winds and frequent wintry precipitation. The first half of March provided some of the coldest and most wintry weather of the year. At many places in South-East England on the 10th the maximum day temperature did not exceed 30 deg. F., while temperature in the screen fell on the 3rd to 1 deg. F. at Braemar, and on the 10th to 5 deg. at Rickmansworth, 13 deg. F. at South Farnborough, and 14 deg. F. at Bournemouth. Snow fell frequently and was widespread on the 9th and 10th, and some roads were impassable for several days. In spite of this, the month on the whole was very dry and sunny except in the South-West. From the end of March until September 5, month after month may be described as dull and wet in many parts. In England and Wales the summer was one of the wettest since comparable records began. A bright spell was enjoyed, however, during the last week in June, and in parts of Ireland and the West and North of Scotland, August was dry and sunny, while in North Wales and North-West England a slight excess of sunshine over normal was also recorded in August. On June 14, that rare phenomenon in the British Isles, a tornado, swept across Birmingham in a northerly direction along a track varying in width from nearly 800 yards to 200 yards. Its passage was marked by much material damage, such as broken houses, stripped roofs, windows blown inwards, uprooted trees and the loss of one life. From August 16 to 24 strong winds and gales were unusually prevalent in the English Channel, and on the 24th the gales were exceptionally severe. The strong winds and high tides caused damage to the bathing tents and bungalows of holiday-makers on the South Coast. Of the autumn months, the last three weeks of September were dry and quiet, though cloudy, while October provided a pleasant contrast to the dull, wet summer by its abundant sunshine and low rainfall. The last ten days were cold and bright, with abnormally low night temperatures. In November and a large part of December temperature was notably high, and November was also stormy and excessively wet, particularly in the West and North. At Valentia, in South-West Ireland, the November rainfall, 12.29 in., was the highest monthly total ever recorded there. Among high temperatures of interest may be noted the minimum, 57 deg. F., at Kew Observatory on November 4, the maximum temperature, 60 deg. F., at Kew on December 4, and the maximum, 61 deg. F., at Aberdeen on December 24. All these were records for the season at the stations mentioned. The gales and high seas of November 10 and 11 in the English Channel raised the tide to such an extent that about 100 recently-built bungalows near Shoreham-by-Sea were damaged or destroyed. Following on a spell of comparatively cold weather, the Christmas season was very mild, but a change occurred about December 28, with cold winds and local sleet and snow from the North.

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600 Hours Between Overhauls

SOME remarkable figures showing the reliability of the Armstrong Siddeley "Lynx" engines have been given by Imperial Airways. They relate to the Avro 10 3-engined monoplanes and show that these machines have between them covered a total distance of 347,300 miles, which is equivalent to nearly 14 times around the world. This tremendous distance has been flown without a single voluntary stop, late departure or cancelled service, a fact which speaks volumes for the Avro 10 monoplanes and Armstrong Siddeley "Lynx" engines. Perhaps even more remarkable is the fact that the time between overhauls of the "Lynx" engines in Imperial Airways' machines has been fixed at 600 hours. Thus on a "cruising horsepower hour" basis the "Lynx" must be an extremely cheap engine to run and maintain, and the combination of the Avro 10 and these engines has proved a very efficient one. By his recent flight to Australia in the Avro 10 *Southern Star*, Kingsford Smith has added yet another proof of their reliability.

Interference

FAILING some new discovery or invention, the vague hope for the advent of which is not likely to advance the science of aeronautics very much, it would seem that the aircraft designer cannot progress very much farther in the matter of drag-reduction than he has already done. The retractable undercarriage offers considerable scope, but the mechanical difficulties are such that hitherto they seem to have overwhelmed the aerodynamic advantages. A reduction in induced drag cannot be carried beyond the limits prescribed by structural considerations of wing weight, and fuselage drag is largely determined by the bulk of whatever has to be carried inside. But there is one direction in which there is still room for considerable improvement: the effect of disturbance in the flow past two aircraft components meeting at more or less acute angles. This flow disturbance is usually called interference, and the drag caused by it is called interference drag. Sometimes (but not often) this interference drag is *negative, i.e.*, the overall drag of two

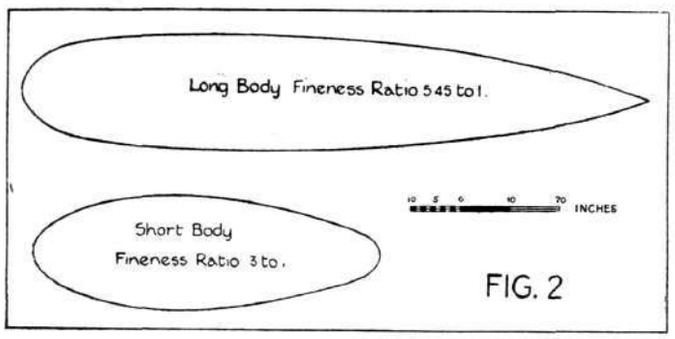


FIG. 2

components is smaller than the sum of the drags of the two components measured separately. More often the interference drag is positive, and quite frequently it is *very* positive. In the worst cases it may be bad enough nearly to ruin the performance of a machine.

Mr. E. Ower, in reading a paper on "Interference" before the Royal Aeronautical Society (with which is still incorporated the Institution of Aeronautical Engineers), pointed out that we all know that the generation of lift is inseparably associated with induced drag, which is the inevitable price we have to pay for transporting loads by air. (As Mr. C. C. Walker always expresses it, "The drag arising from carrying a certain load on a certain span at a certain speed."—ED.). We also knew that two other types of resistance opposed motion through the air: Friction and turbulence. Friction between the air and the surface of the body moving through it, and with the air streaming parallel with the surface. Turbulence set up when the direction of flow was not parallel with the surface. The drag due to turbulence was usually much greater than that due to friction. By suitable shaping of the body it was sometimes possible to suppress turbulence and obtain a drag almost entirely due to surface friction.

The lecturer recalled our indebtedness to Professor B. Melvill Jones for the establishment of an ideal: The aircraft in which total drag is reduced to two unavoidable components: the induced drag and the surface friction, the measure of the perfection of any design being the closeness with which it approaches to this ideal. In his 1928 lecture Professor B. Melvill Jones calculated that many commercial aeroplanes consumed from one-and-a-half to three times as much power as the ideal aeroplane of the same span, and machines of to-day were not, Mr. Ower said, very different. Thus there was room for improvement.

Since we had learnt by experience how to design streamline bodies, there seemed to be no theoretical reason why it should be impossible to construct combinations of these bodies such that the drag of the combination was also mainly due to surface friction. The problem was complicated by the phenomenon of "interference." The interference effect might be of two kinds: that in which there were in the combination sources of turbulence which were non-existent in the undisturbed flow past the components, and another in which the pressure and velocity distributions around the components were changed. The former must always result in increased drag, but the latter might have an opposite effect. Interference effects tended to become more marked as the shapes of individual parts of an aeroplane improved aerodynamically.

Before beginning what may be termed the descriptive part of his paper, Mr. Ower pointed out that, with few exceptions, the experiments described did not include the effect of airscrew slipstream. It was hoped to make some experiments to determine what was likely to be this effect, but he thought it unlikely that any of the factors which he would indicate as promoting bad interference drag in the absence of slipstream would be so modified by the slipstream as to cease to be detrimental.

The first part of the paper dealt with the subject of the boundary layer and the intensity of surface friction in the boundary layer. The next described some experiments with excrescences on streamline bodies, these excrescences being in one case flat discs and in another small streamline bodies so placed as to touch the surface of the large streamline body. Reference was also made to experiments with rings of circular cross-section. The most important conclusion to be drawn from these experiments, the lecturer stated, was that provided the boundary layer was turbulent, as it generally would be at full Reynolds Number, the addition of an excrescence near the nose was less detrimental than the addition of the same excrescence farther aft. Another important conclusion was that pressure changes played a very important part in interference effects, and that there might be some possibility of turning such changes to advantage by suitable arrangement of the interacting surfaces.

Body-Wing Interference

On this subject the lecturer gave references to work carried out by Parkin and Klein in Canada and by Muttray in Germany. He confined himself mainly to work done at the N.P.L., and explained that the bodies used were those previously referred to and shown in Fig. 2. (We have not the space to publish all Mr. Ower's illustrations, but for the sake of simplicity in quoting the lecturer we have retained his original numbering of illustrations.—ED.). Most of the tests were made with the smaller body, *i.e.*, that having a fineness ratio of 3 to 1. Provision was made to attach to this body wing roots of R.A.F.31 section at a number of positions (see Fig. 11). The roots were finished square, and dummy extensions were supported from the tunnel walls, leaving a small gap between their inner ends and the outer ends of the roots. This was, of course, done to eliminate end effects and produce "infinite aspect ratio" characteristics, *i.e.*, two-dimensional flow over the outer wing portions.

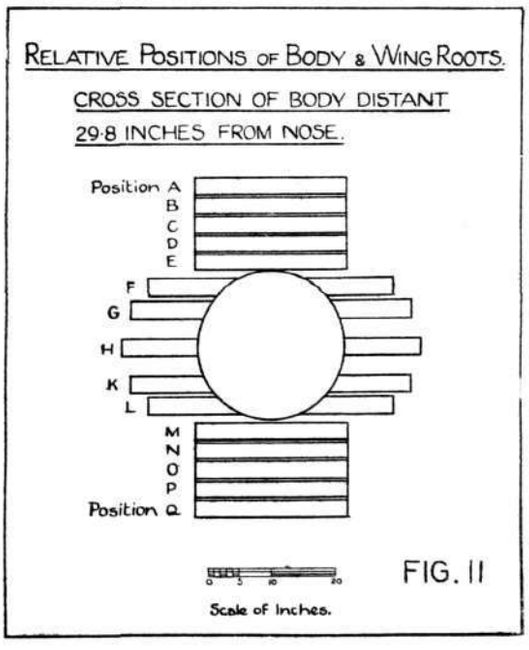


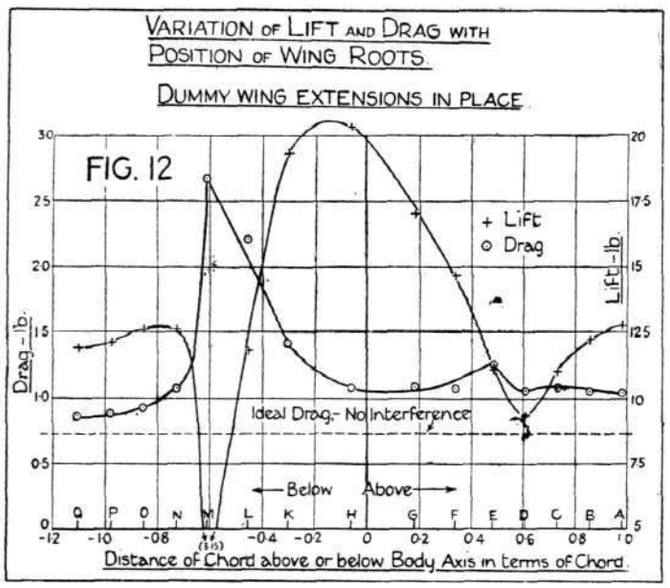
FIG. 11

In the first series of tests the body axis lay along the wind direction, and the wings were at 0 degrees incidence (k_L = 0.227). The results are shown in Fig. 12. The best position was H, midway up on the fuselage.

The next experiments were conducted to discover to what extent interference depended upon lift. Here positions H and L were used, as representing a good and a typically bad position. Lift was varied in two ways: First the angle of pitch of the body was changed, the angle between wings and body being

kept constant. Secondly the angle between wing and body was changed, keeping the fuselage angle at zero. The results showed that in position L the interference drag increased very rapidly with lift. In position H there was also an increase, but much less pronounced.

Experiments on the effect of fillets, or fairings in the angles at junction of roots and body, showed the results illustrated in Figs. 14 and 15. The fillets had radii ranging from 0.0104 to 0.125 wing chords, and the improvement was very striking. In general the improvement



was greater the worse the position of the roots relative to the body, but the largest improvement in drag was obtained not in the worst position (M) but in the position above this when the reduction due to a fillet of radius one-sixteenth chord was about 45 per cent. As a general result, little was gained by increasing the radius of the fillets beyond one-sixteenth chord.

Tests were also made with the longer streamline body (5.45 to 1, Fig. 2) and R.A.F.31 wings, and the results were of approximately similar character, but the magnitude of the interference was less than with the short body.

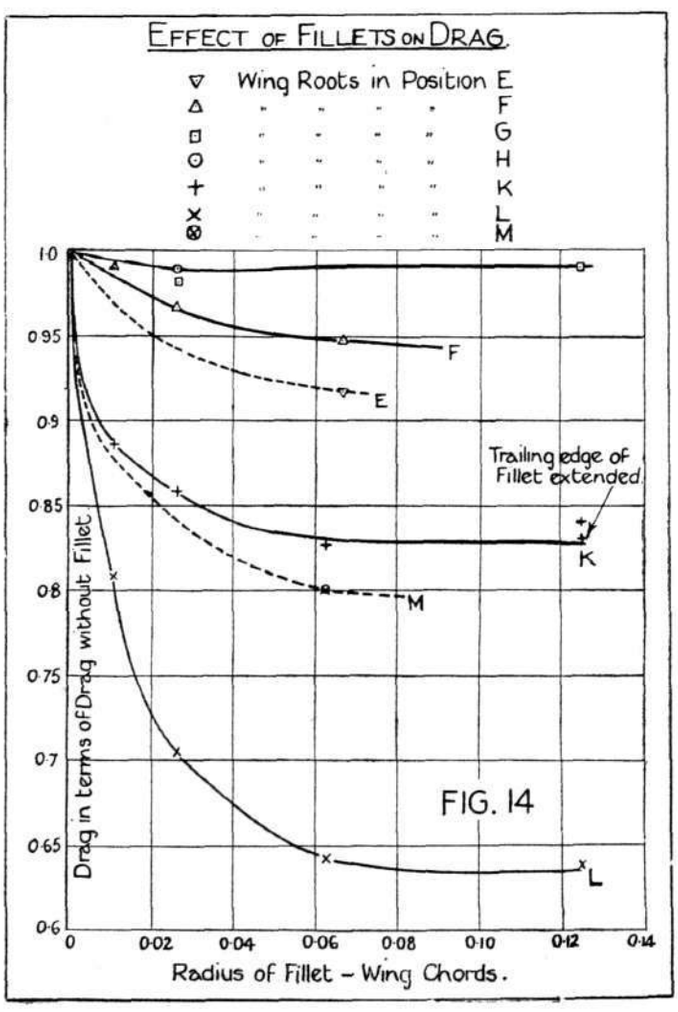
Interference Effect Explained

The portion of Mr. Ower's paper in which interference effect was explained was, we think, so extremely helpful that we consider it essential to publish it in full. It was as follows:

"In all the combinations tested, the body surface was converging in the direction of flow aft of the mid-chord of the wing-roots. Hence, in order to follow both the wing and the body surfaces, the air stream behind the mid-chord would have to expand. Any such expansion would, of course, be accompanied by a positive pressure gradient in the direction of flow, the static pressure increasing at the expense of the speed. We have, in fact, conditions comparable with those existing in the outlet cone of a Venturi tube, and it is well known that if the angle of this cone is too great the stream cannot expand fast enough to fill the cone, and the flow detaches itself from the walls. The criterion of whether the cone will or will not run full is whether the kinetic energy in the boundary layer is sufficient to overcome the pressure gradient accompanying the expansion. With the body-wing combinations the conditions on the upper surface of the wing are more unfavourable still, on account of the steep positive pressure gradient that occurs on the upper surface of a wing behind the section of maximum suction; the flow has to overcome this gradient as well as that due to the geometrical divergence of wing and body surfaces. It is, therefore, not difficult to understand that a condition may well be reached when the kinetic energy of the boundary layer is insufficient to overcome the total pressure gradient. When this occurs the flow will detach itself from the upper wing surface. and also, probably, from the adjacent portion of the body surface, with a resulting increase in drag and decrease of lift. On the under surface of the wing the pressure gradient is of opposite sign, and so will, to some extent, assist the flow to adhere to the surfaces. Also, in the cases tested, the divergence of the body surface from the lower wing surface was less than from the upper surface.

"It appears, then, that the divergence of body and wing surfaces provides a possible explanation of the observed effects. Consideration of the geometry of the combinations furnishes confirmation of this hypothesis, for we find that the expansion over the rear half of the wing chord was greater for a given position of the wing below the horizontal median plane of the body than for the corresponding position above. On these grounds, therefore, we should expect to find that positions below the centre of the body were worse than corresponding positions above, and also, since the divergence was greater, the further the wings were above or below the median horizontal plane, that the interference became progressively worse as the roots receded from the central position H. Inspection of the surves of Fig. 12 shows that these anticipations accord well with the results actually observed.

"It also follows from the geometry of the combinations tested that the circular fillets on the upper surface of the wing to some extent reduced the amount by which the air had to expand to follow the surfaces. This, then, will account, qualitatively, for the beneficial effect of the fillets. They would have further improved the flow had they been made to increase in radius towards the trailing edge of the wing, so as further to reduce the expansion, and also had they been better shaped at the back in order to suppress abrupt changes of section of the structure in the region where the fillets terminated. Such fairings would operate in the sense that they retarded the rate of expansion. It is in the boundary layer that any break-away that takes place has its origin, and since this layer is continually receiving fresh kinetic energy from the general airstream outside it as the flow proceeds along the surface, it is easy to understand that the rate of expansion is the important factor. The flow may be able to accommodate itself to a given expansion gradually, whereas a break-away might take place if the same expansion of the area to be filled occurred in a shorter length. The analogy of the Venturi tube is again useful here; by making the outlet cone of sufficiently gradual taper the flow may be expanded without loss of head (apart from wall friction) to almost any desired section."



As further support of the divergence hypothesis, Mr. Ower referred again to the tests with a longer body, in which, of course, the divergence was considerably less than in the short body, the taper being more gradual. On test the interference effect proved smaller with the long than with the short body.

Nacelle-Wing Interference

The interference effect of an engine nacelle placed in proximity to a wing could, Mr. Ower said, be regarded as an extreme case of body-wing interference, in which the body had shrunk in relative size. The worst cases were when the nacelle was in actual contact with the wing surface, worse when the nacelle was on top of the wing than when it was below the wing. The best position was that in which the axis of the nacelle coincided with the wing chord, and the nacelle surfaces were well faired into the wing surfaces.

The last part of Mr. Ower's extremely valuable paper dealt with methods of producing, artificially by means of threads, turbulent flow over streamline models in the wind tunnel, so that when turbulence had been attained, full-scale conditions were more nearly represented and the model could then be used for interference tests.

THE DISCUSSION

Before calling upon Mr. North to open the discussion, Mr. Fairey (who was in the chair) said there was one question he would like to ask, namely whether the streamline motor cars produced were of the right form in view of their closeness to the ground, where there must be some sort of interference, and he understood that one of the things which the designer had to guard against was an air flow which tended to *lift* the car.

MR. J. D. NORTH said he was very glad that the experiments on interference were not made with models resembling more closely actual aeroplanes, as if that had been the case much of the value of the experiments would have been lost. What one wanted was general information on the subject, and this could best be obtained by the use of models of the nature described by the lecturer. What had particularly impressed him was Mr. Ower's use of the expanding air stream in explaining interference. That, he said, gave designers a better picture of what they were trying to do than had anything hitherto suggested, and he thought that this one feature of the lecture alone had made all the work well worth while.

There were one or two minor questions he would like to ask. The first referred to the pressure plotting on the bodies. He assumed the pressures were mean pressures around the surface, and not local pressures. He was a little surprised to find that after the pressure distribution had been disturbed by the presence of circular discs close to the surface of a body, the graphs showed that pressures were restored very quickly (*i.e.*, in a short distance downstream), and thought that probably if square plates had been used the disturbance would have extended farther aft, or downwind.

In connection with the wing-body interference tests, Mr. North was curious to know what would have been the effect if, instead of the wing roots being of the same area in all positions on the body (see Fig. 2) they had been made the same actual overall span and the interference measured at the same lift. His own view was that the really important thing was the angle at which the wings met the body. If, in the tests, the inner ends of the wing roots had been curved upward or downward so as to meet the body surface at right angles, he did not think the height of the wings relative to the body would have made very much difference to the interference drag.

At Boulton & Paul's they had, Mr. North said, made some experiments with airscrews running, not merely with a single but with three airscrews, and the effect on interference was considerable. The effect extended to well behind the tail of the machine, and interference effects on the tail surfaces and fuselage were quite serious. He thought exploration of interference in this region would be valuable.

MR. RELF pleaded for a correlation of the work of Mr. Ower and Mr. Farren. He could imagine that if experiments were made in the smoke tunnel with what was known to be a bad combination, and this was faired and altered until the smoke tunnel showed smooth flow, and the combination was then tested in the wind tunnel for drag, that drag would be found to correspond to laminar flow.

MR. WILLIAMS thought it unfortunate that the paper rather tended to give a bad impression of the low-wing

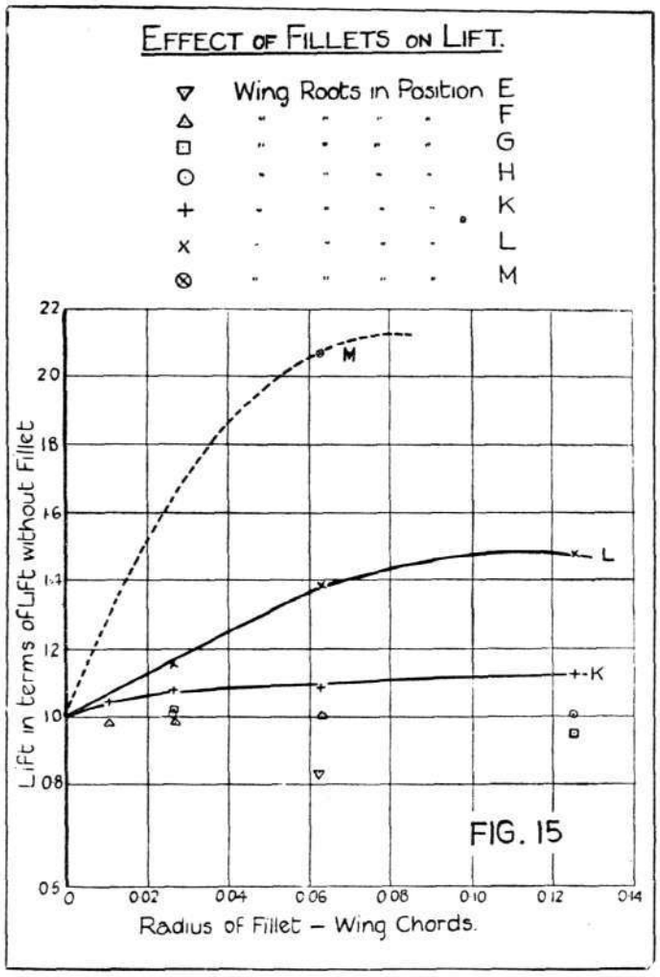


FIG. 15

monoplane combination, as it was a very useful type, and need not be as bad as the experiments indicated. In the matter of engine nacelles on the wings, the main thing was to retain the load-grading undisturbed.

Other speakers took part in the discussion, but their questions will be clear from the lecturer's replies.

MR. OWER said that he was unable to answer Mr. Fairey's question concerning the right shape for a streamline motor car. Mr. North was correct in assuming that the pressures plotted were mean pressures. Tests *had* been made with square plates instead of discs, but the interference effect was very little different, and he had not thought it worth while to include the results in the paper. Concerning the measurement of interference effects with wing roots of the same actual overall span, such tests were now being made.

In reply to Mr. Williams and Mr. Manning concerning the low-wing arrangement (Mr. Manning had pointed out that this was used on the Schneider machines), Mr. Ower admitted that one *could* get an economical drag by fillets, suitable angles, etc., but when the surfaces converged the arrangement tended to be bad. He agreed with Mr. Relf about the value of visual flow exploration, but could not quite agree with Mr. Townend about the discs removing the edge of the boundary layer, because if boundary layer was already turbulent one could not make it any more turbulent.

R.Ae.S. Lecture

ON Thursday, January 28, Mr. A. E. Woodward-Nutt, B.A., A.F.R.Ae.S., and Flt. Lt. A. F. Scroggs, B.A., D.I.C., R.A.F., will read their important paper on "Some Factors Affecting Range, with Special Reference to Height," before the Royal Aeronautical Society. The importance of range to all descriptions of aircraft is considered and the methods of improving it by increasing the aerodynamic efficiency and the thermodynamic efficiency. The paper deals chiefly with the latter. The results of a series of tests are given showing how uneconomically engines are normally run and various means for improving economy are suggested, and possible future developments. The lecture will be delivered in the Lecture Hall of the Royal Society of Arts, 18, John Street, Adelphi, W.C.2, at 6.30 p.m., and will be illustrated with slides.

THE FEDERATION AERONAUTIQUE INTERNATIONAL

A SPECIAL Meeting of the Fédération Aéronautique Internationale was held at the Aero Club of France, in Paris, on Thursday and Friday of last week, January 14 and 15. These sessions were preceded by a meeting of the Contest Committee Thursday morning, and the formal opening of the special meeting, over which Mr. Jacques Louis Dumesnil, the French Air Minister, presided, was held Thursday afternoon. The working sessions of the meeting did not, however, begin until the Friday morning. A banquet, attended by over 300 guests, was held in the large meeting room of the Aero Club Friday evening, which was followed by a concert. Mr. Pierre Etienne Flandin, French Minister of Finance, who is also President of the Aero Club, presided. Mr. J. L. Dumesnil, the Air Minister, Etienne Riche, Under-Secretary of State for Air, Gen. Piccio, Italian Air Attaché, Marshal Franchet d'Esperey and many other notables from various countries represented in the F.A.I. were also present.

The Gold Medal of the Aero Club of France was to have been awarded at this dinner to Gen. Italo Balbo, the Italian Air Minister, in honour of the Transatlantic flight of the Italian squadron last year, which he led. The General, however, was unable to be present, and the medal was received by Gen. Piccio to be forwarded to him.

The British delegates to the special meeting were Col. Mervyn O'Gorman, Maj. Darwyn and Capt. Lamplugh. The American representatives were Godfrey L. Cabot, former President of the National Aeronautic Association of America, Col. F. B. Lahm, U.S. Air Attaché in Paris, and Sidney B. Veit.

A number of important decisions were taken during this special meeting of the F.A.I. at which Prince Bibesco, the President, presided. The Grand Gold Medal of the Federation (F.A.I.) was awarded to Dr. Eckener, commander of the *Graf Zeppelin*, for his services to aviation during his aeronautical career and in particular for his flights to North and South America.

A modification of the statutes of the F.A.I. was adopted. In principle, the President shall only serve for three years, and his successor shall be of a different nationality.

It was decided to hold the routine meetings of the F.A.I. as usual. In case of necessity, however, a meeting of the general committee shall be called, at which each country can be represented.

A report was made to this special meeting of the meeting of the Air Ministers at Bucarest last autumn, communications relating to which were received from Mr. J. L. Dumesnil, Lord Londonderry, Gen. Balbo, and Herr von Hoeppner. These reports stated that a unification and diminution in the landing fees for tourist planes could be expected ; that an international map for air touring should be adopted and the payment of taxes and fees by international checks should be effected.

On the report of the Aerology Commission, presided over by Gen. Sacconey, and of which Dr. Georgii has just been elected a member, the meeting voted to consider the density of the air instead of the pressure in making the calculations for altitude records. Before putting this rule in force, however, an examination will be made of the existing instruments available for making these calculations so as to determine before the end of the present year which thermobarographes are the best. In making this report the Aerology Commission desired that the temperature of the atmosphere at high altitudes should be taken into consideration, as it has an effect on the recording instruments.

At the request of the United States, the present holders of the Gordon Bennett Balloon Cup, this competition will be held this year in Europe. Poland, Roumania and Germany, who had desired to hold this contest, agreed on Switzerland, and it was decided to hold this Gordon Bennett Cup Balloon Race at Bale between September 20 and October 10 next.

This Special Meeting of the F.A.I. also adopted the following resolutions in principle. These must be submitted to the Aero Clubs of each country which is a member of the F.A.I., and also examined by the International Contest Committee, which is charged to present a report on these new regulations at the meeting of the F.A.I. to be held at The Hague on September 5, 1932.

(1) To adopt a new method of control (supervision) for the international long-distance continuous-flight records. This would permit the aviator to be "checked up" at different points during his flight, separated by at least 1,500 km. (950 miles), so that he can benefit by the actual distance flown.

At present the distance for these records is calculated as being a straight line between the point of take-off and landing. By this new method, if adopted, the aviator will get the benefit of any detours that he may make provided that he is "checked up" on them.

(2) A complete revision of the list of international records. Also, the abolishment of the records for carrying different loads, which no longer correspond to present conditions.

(3) The creation of special records for flights made in a broken line.

That is to say, if an aviator desires to make detours in a long-distance continuous record flight, he can do so provided he is "controlled" ("checked up") on them, as previously mentioned in Section 1. A new record will be created for flights of this kind.

(4) The creation of a "round the world" flight record, the Cup for which has been presented by Prince Bibesco. This "round the world" flight would take place over an itinerary to be agreed on in advance and to start from a point on such itinerary.

(5) The modification of the regulations concerning lightplanes and seaplanes.

(6) The creation of a series of international records for planes with "rotating supporting surfaces," and also for amphibian aircraft.

This Special Meeting also approved the proposed itinerary of the Challenge International de Tourisme for 1932, which will be managed by the Aero Club of Germany. The meeting likewise adopted in principle the proposition of the delegates from Holland for the creation of an international insurance for aviators against damages that they might cause to third persons. This proposition is of the greatest interest to airmen who can present their insurance policy and notify the Aero Club to which they belong. They can then continue on their flight without loss of time, their Aero Club taking care of the defence of their interests.

The Special Meeting named Col. Walaardt-Sacre the Secretary Rapporteur for 1932, and voted to be represented by its Secretary General Mr. Paul Tissandier at the European Conference of Touring, which will be held at the end of May. The meeting also approved the Aeronautical Programme appended. R. C. W.

F.A.I. PROGRAMME, 1932

May 22–30.—Conference of Transoceanic aviators at Rome.
June 25–26.—International Tourist Rally of the Aero Club of Boulogne.
July 2–3.—International Tourist Rally at Reims, organised by the Aero Club of Champagne.
July 9 and 10.—International Tourist Rally and Meeting at Clermont-Ferrand, organised by the Aero Club of Auvergne.
July 14.—International Rally at Saint-Brieuc organised by the Aero Club of the Cotes-du-Nord.
July 16–17.—International Meeting at Dieppe, organised by the Aero Club of Dieppe.
July 22–31.—International Meeting at Zurich.
August 11–28.—Challenge International de Tourisme, organised by the Aero Club of Germany.
September 8.—International Meeting at Vicenze, Italy.
September 25–*October* 8.—Gordon Bennett Cup for Balloons. Meeting at Basle.

Move of Coastal Area Headquarters

THE headquarters of the Coastal Area, Royal Air Force, which is commanded by Air Vice-Marshal R. H. Clark-Hall, C.M.G., D.S.O., is being moved from Tavistock Place, London, to Lee-on-Solent, Hants, on January 18.

As from this date No. 10 Group, under which the Coastal Area Units in the Portsmouth district have hitherto been placed, will cease to exist, and all units in the Coastal Area will be administered direct by Headquarters, Coastal Area. The Coastal Area Command was formed on September 15, 1919, and to-day comprises all units serving at the stations at Calshot, Lee-on-Solent, Gosport, Mount Batten, Pembroke Dock, Felixstowe, Donibristle, Leuchars and Novar. The Air Officer Commanding, Coastal Area, is also, for such matters as are the responsibility of the Royal Air Force, the administrative authority for Headquarters Units and Fleet Air Arm Flights in Aircraft Carriers, and in H.M. Ships equipped with catapults, in home waters.

Airisms from the Four Winds

Mrs. Westenra's African Flight

THE HON. MRS. WESTENRA and Capt. R. H. McIntosh successfully concluded their African air tour in a " Puss Moth " on January 16, when they arrived at Stag Lane Aerodrome from Le Bourget. As mentioned last week, they left London on November 6, and arrived at Cape Town on December 2, starting on the return journey a few days later. Their tour took them over about 23,000 miles in 235 flying hours, the route followed throughout being as follows:—*Out.*—London, Paris, Marseilles, Rome, Catania (Sicily), Tunis Tripoli, Gulf of Sollum, Cairo, Assouan, Wady Halfa, Khartum, Juba, Entebbe (Lake Victoria), Nairobi, Dodoma, M'buia, M'piki, Broken Hill, Bulawayo, Johannesburg, Cape Town. *Home.*—Victoria West, Kimberley, Johannesburg, Bulawayo, Salisbury, Broken Hill, Elizabethville, Leopoldville (Belgian Congo), Coquinhatville (Congo), Bangui (Ubang), Port Archambault, Fort Lamy, Kano (British Nigeria), Niamey, Gao (Niger), and thence across the Sahara to Reggan and Oran, on the coast of Algeria.

R.A.F. East Africa Flight

CONTINUING their tour of East Africa, the four Fairey III F machines of No. 14 (Bomber) Squadron, under the command of Flt. Lt. R. L. Atcherley, reached Malakal from Khartoum on January 14. On January 16 they arrived at Entebbe, where they took part in manœuvres with the King's African Rifles.

The Mollison-Saul Flight

CAPT. J. P. SAUL has returned to Dublin after a short visit to London, where he discussed plans for his forthcoming flight from Portmarnock Strand, County Dublin, to New York and back, with Mr. J. A. Mollison. It is understood that the flight is likely to start about the middle of May. The machine to be used has not been definitely selected, but a Lockheed " Vega " has been suggested. It is also reported that Mr. Mollison intends to make another attempt on the England-Cape record (in a " Puss Moth ") before the Atlantic effort.

Avro 10's for Egypt

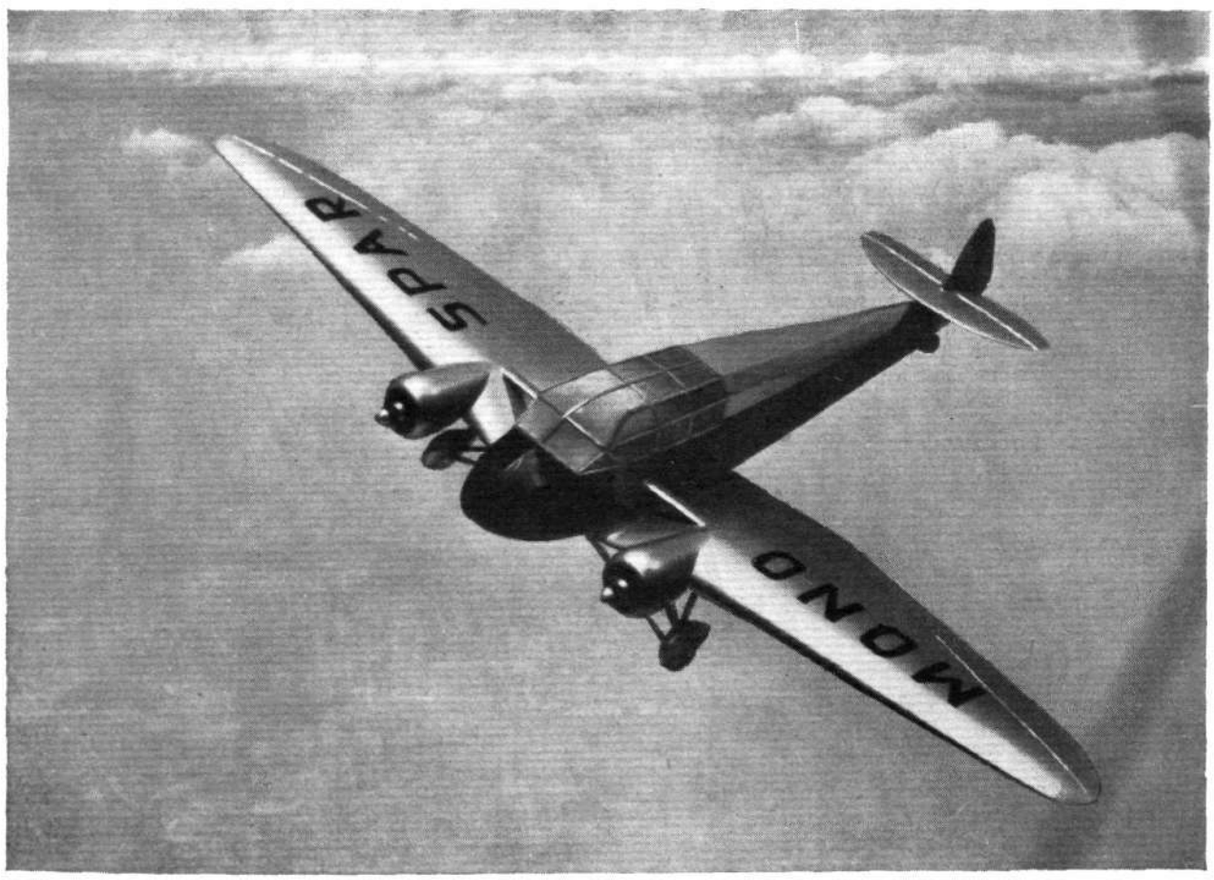
IN SPITE of being held up for two days by bad weather in France the two Avro 10's, which Airwork, Ltd., of Heston, are supplying to the Egyptian Government, have made a rapid trip to Abukir. Piloted by Flt. Lt. C. Clarkson and Capt. Dan Cameron, they left England on January 12 and reached Abukir on January 18.

The U.S. Airship " Akron "

IT is reported from Washington that charges concerning the safety and airworthiness of the United States Navy airship *Akron* will be made before a Congressional committee this week by Mr. J. V. McClintic, a member of the Naval Affairs Committee.

Post for Round-the-World Airman

MR. HAROLD GATTY, who, with Mr. Wily Post, flew round the world in nine days last year, has been appointed senior aerial navigation engineer at the U.S. Army Air Service Wright Field Aerodrome, Dayton, Ohio. Mr. Gatty, who is an Australian, was recommended by the War Department which stated that he was " probably the world's best aerial navigator."



SAFETY, COMFORT AND EFFICIENCY: Attention to detail design is undoubtedly the secret of successful aircraft. This week we publish a report of the lecture on " Interference " by Mr. E. Ower, in which many interesting points are raised, particularly with regard to the interference between the wing root and the fuselage. Above, it will be seen that the aircraft being turned out by General Aircraft, Ltd., of Croydon, embody very definite ideas on this subject. Mr. H. J. Stieger is one of the younger generation of designers who are not afraid of incorporating ideas which are radically different from those of accepted practice. The Monospar aircraft appear to be streamlined to the limit, while at the same time providing a perfect view for the pilot, together with immunity from forced landings by virtue of the two Pobjoy engines which are used. The full four-seater fuselage does not appear bulky, yet ample room is provided for the passengers. For commercial work where a large number of passengers is not required this machine should have a wide field of usefulness. (FLIGHT *Photo.*)

A NEW COUZINIT: At the last Paris Aero Show Rene Couzinit exhibited a small three-engined monoplane with Salmson A.D.9 engines. That machine had a retractable under-carriage. The new type shown here has a fixed under-carriage fitted with "spats," and the engines are De Havilland "Gipsy III." The wing between outboard engines and fuselage is very thick. This machine may soon be sent on a world tour.

An Aerial Survey of the Free State

THE possibility of an aerial survey of the Irish Free State being undertaken by the Army Air Corps is under discussion in Dublin at the moment. The Ordnance Survey maps of the country are very much out of date, and it has been estimated that by ordinary methods, such as are employed at the present time, it would take 50 years to complete another survey. Air surveying has already been undertaken successfully in a small way by the Air Corps in co-operation with the Archæological Research Commission and also the commissioners of certain harbours around the coast. In Northern Ireland the Royal Air Force have practically completed a survey of the whole territory.

Mrs. Victor Bruce in Dublin

ON January 14 the Hon. Mrs. Victor Bruce left Heston in her Blackburn "Bluebird" to fly to Dublin, to deliver a lecture before the Royal Dublin Society. After calling at Hooton she ran into heavy weather but continued her flight until some 15 miles out over the Irish Sea, when a 75-mile-an-hour wind and diminishing petrol supply made her turn back. Observing her flying very low over the surface of the water a coastguard thought the machine had crashed and turned out the local lifeboat much to the annoyance of the crew, who saw the "Bluebird" soaring rapidly back towards Sealand, where Mrs. Bruce landed. She continued her journey to Dublin by boat and on the following day delivered her lecture, "Flying Alone Round the World," to a "full house." In the course of her lecture Mrs. Bruce said that she had never before encountered such a storm as that which she met with over Holyhead and the Irish Sea.

A Useful Guide

NEDERLANDSCHE LUCHTVAARTTIJDSCHRIFTEN CENTRALE, of Willem Barentzstraat 19 Utrecht, Holland, have recently published an extremely interesting "International Guide of Aeronautical Periodicals." This publication aims to give a bibliographical record of the periodicals on aviation all over the world. It will, therefore, be a guide for editors, libraries, companies and all institutes who find it necessary to have information on aeronautical publications. The work has been made as complete as possible and contains, besides the name of popular and technical journals, a list of those edited by clubs and societies, official Government publications, laboratory bulletins, aeroplane manufacturers and air travel companies' reports. It is printed both in Dutch and English, and classified according to the country of origin. Part 1 is an alphabetical list of periodicals now in print; Part 2 is devoted to those out of print and in cases where these have been absorbed by other journals this is indicated. In part 3 the publications are arranged under headings according to the subjects with which they deal, and under each heading these lists are further subdivided according to the countries. The edition is limited and this copy is being sold for Fl. 0.75.

More and More Caterpillars

DURING 1931 more new members of the Caterpillar Club from Royal Air Force personnel were registered than in any previous year. The total for the year as far as can be ascertained is 26. The new members are as follow:—Sgt. Pilot H. V. Hudson, L.AC. H. C. Molyneux, Sgt. Pilot H. E. Rous, L.AC. A. Cameron, E. E. Smith (A.A.F.), F/O. C. M. Chambers, Sgt. Pilot P. C. Ginn, Flt. Lt. E. S. Borthwick-Clarke, P/O. W. H. Kyle, F/O. K. L. M. Davy, Sgt. Pilot A. S. Blake, F/O. R. G. Weighill, P/O. E. D. Green, AC. I. D. O'Brien, Sgt. Pilot D. J. Pitcher, L.AC. W. R. Fraser, Flt. Lt. A. G. Pickering, Sgt. Pilot C. G. R. Lewis, L.AC. E. Groombridge, Flt. Cadet J. Bradley, F/O. G. O. St. J. Morris, P/O. C. L. Tapley, Flt. Lt. H. Seton-Broughall, Lt. P. L. Jamison, R.N., L.AC. R. W. Older and F/O. L. R. Mouatt. Two officials of the R.A.E. also qualified. Mr. E. R. Alexander saved his life at South Farnborough and Mr. A. Woodward Nutt escaped with Flt. A. G. Pickering at Felixstowe.

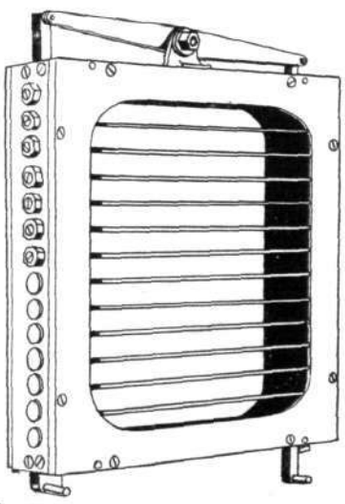
THE DE HAVILLAND "TIGER MOTH" IN SWEDEN: Captain H. Broad recently gave a series of demonstration flights at Barkeby, as a result of which the Swedish Air Authorities purchased the demonstration machine at the conclusion of the trials. In the photograph are seen Captain Broad, Major V. Porath, Director of Equipment, General Virgin, and Captain A. Florman.

The Industry

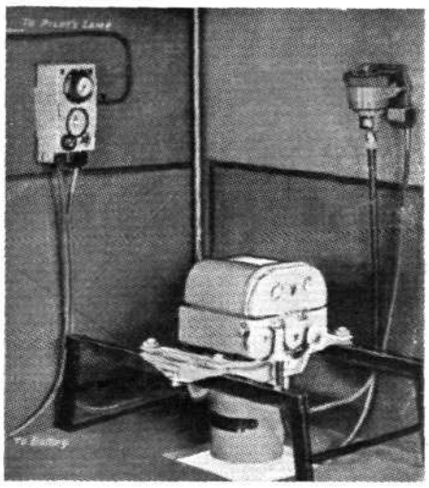
WILLIAMSON "EAGLE" III CAMERA

THE INCREASED confidence in the use of film for aerial photography has inspired the Williamson Manufacturing Co., Ltd., to produce another model of the well-known "Eagle" camera, classed as the "Eagle" III. A notable reduction in size and weight has been achieved by reducing the picture size to 5 in. by 5 in., resulting in a camera light and handy enough for use by hand for oblique photography while remaining adaptable to a vertical mounting for survey purposes, and operated semi-automatically by flexible drive and an air vane, or fully automatically by motor. The unit method of camera construction, which reduces the number and size of moving parts to a minimum, has not been sacrificed in the "Eagle" III, and, apart from the camera itself, all attachments and controls, such as the flexible power drive, electric connections, motor, etc., are identical and interchangeable with the older types. The one exception to this is the lever release which operates the camera by pushing instead of pulling.

Of very special interest in the "Eagle" III is the inclusion of the Williamson all-metal Louvre shutter, with which the Company have been experimenting for several years. Of the types of shutter previously developed the focal plane shutter gave the best results except with regard to distortion under certain conditions. The Louvre shutter consists of a number of thin steel metal strips fitting together like a Venetian blind, half of which rotate in a clockwise direction and the other half anti-clockwise, ensuring among other things even illumination over the whole negative, and no distortion of the image, as the whole area of the lens is simultaneously uncovered. Interposing these thin metal strips between the lens and the image might seem to interfere with the light, but the actual light efficiency obtained is 80 per cent., which means that the interference is almost negligible.



The Williamson Louvre Shutter. This provides even illumination without any distortion of the image.



The "Eagle III" aircraft camera fitted for vertical photography in an aircraft.

Another special feature of the new camera is that the recording of instrument readings is optional. The instrument box is an entirely separate, optional and independent accessory. If fitted, the readings are recorded not on the pictures but in the margin of film between exposures, so that there is no wastage of film. Four instruments are contained in the box:—a counter mechanically operated from the main camera gearing, a watch with centre seconds hand, an Ivorine tablet for recording data or advertising matter, and a revolving dial aneroid recording up to 15,000 ft., or as required and ordered. Each instrument is arranged on a sliding fitting for ease of repair or replacement.

When the "Eagle" III is to be operated automatically or semi-automatically, the ordinary lid on the camera body is replaced by a similar lid carrying a worm reduction gear and connections for the flexible driving shaft, an arrangement which lightens the camera for hand work, and further allows for quick inspection of the gearing.

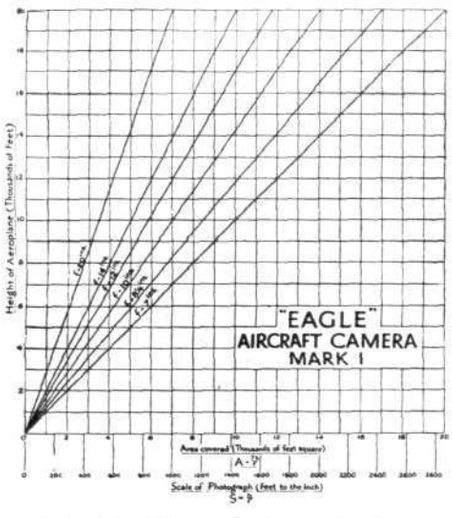
All gearing is totally enclosed, and the gear ratio is such that when the camera is driven by the standard 12-volt electric motor, photographs can be taken at intervals of 3½ seconds. Alternative operation by hand is obtained with a large knob.

For hand operating a hand mounting gear is provided. It consists of an aluminium ring machined and fitted to the camera body, with hand grips, trigger for firing the shutter, and a platform for securing a viewing sight.

When mounted on the camera the latter is conveniently balanced for oblique photography. The attachment takes but a few seconds and no adjustments or connections are necessary. The trigger attachment automatically falls into position in the camera body and locates the mounting centrally, while a single knurled screw secures it in position. For air reconnaissance or survey photography the accepted principle is to fix the camera in the aircraft with an optical axis as near as possible at right angles to the normal flying angle of the machine. It is then the business of the pilot to correct any deviation from this angle on receiving a warning that a view is about to be taken. The vertical mounting for the "Eagle" III has therefore been designed to allow for adjustments for correction of tilt in both planes and adjustment for drift. The supporting of the camera is as near the centre of gravity as is consistent with accessibility and method of control, and large spirit levels are conspicuously mounted for reading in flight. The bearers are interchangable on supports for the "Eagle" I and II.

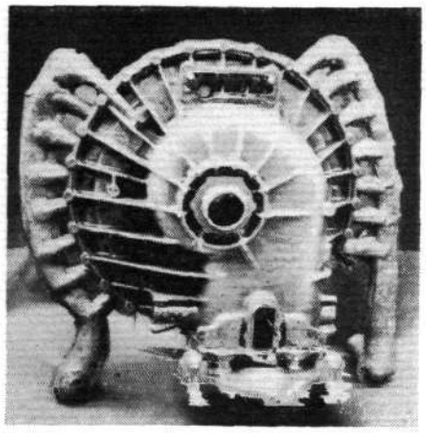
Two sight patterns are available, tubular and open frame. Either can be screwed to the hand mounting already described. The tubular sight is fitted at each end with crossed wires which indicate the absolute centre of the picture, but the whole area to be photographed is not indicated. The open frame sight is so proportioned as to reveal the area covered by a 10-in. focus lens, and the adjacent country can be viewed at the same time through the sides of the frame.

The film capacity of "Eagle" III is 125 exposures, each 5 in. by 5 in. Last, but not least, we understand that the reduction in the size and weight of this new type carries with it a reduction in price. A London office in Bush House, Aldwych, W.C., has now been opened by the Williamson Manufacturing Co., Ltd., where the "Eagle" models will be on show.



AREA COVERED *and* SCALE of PHOTOGRAPH
with lenses of different foci
on a
7" x 7" PICTURE

This area will of course be different for the "Eagle" III using a 5" x 5" picture.



A typical Hiduminium casting for the blower casing of the Rolls-Royce "R" engine.

HIDUMINIUM R.R. ALLOYS

IN THE ACHIEVEMENT of the Rolls-Royce "R" engine at the Schneider Contest of last year, technical interest in the design did not pass over the fact that all the aluminium parts, including the supercharger casing, cylinder blocks and crankcase, were manufactured of "Hiduminium" R.R. 50 aluminium alloy. The perfect reliability of these parts under gruelling stresses probably lies in the fact that detail design throughout is deliberately and exactly adapted to the peculiar properties, and the limitations, of aluminium alloy in the cast state.

The successful production of high-quality alloys depends entirely on obtaining a close-grained structure in the ingot form. R.R. alloys have a fine close-grained crystal structure which indicates an ideally homogeneous material ensuring consistently high-quality results.

R.R. alloys have been developed by Rolls-Royce, Ltd., and are manufactured by High Duty Alloys, Ltd., Buckingham Avenue, Trading Estate, Slough, who are meeting with a considerable demand for their work from many foreign countries, including Poland, France, Czechoslovakia, Sweden and Italy.

They are produced in the form of ingot, castings, forgings or stampings. R.R. 50 alloy has among its other constituents, copper, silicon, nickel and titanium, and in the cast form it has an ultimate strength of not less than 12 tons with an elongation of 3 to 8 per cent. When sand-cast with a low temperature heat treatment it has a strength of not less than 14 tons and elongation of 3 per cent. It retains its strength at high temperatures and is consistent as a production material.

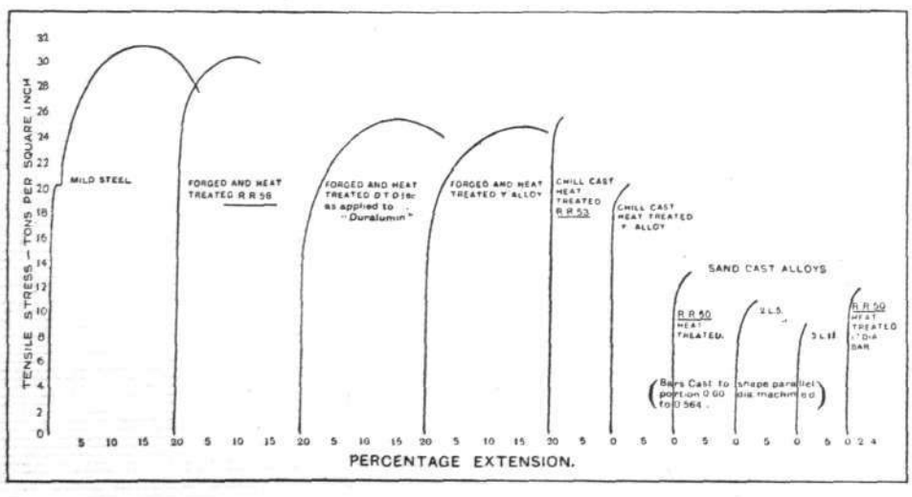
R.R. 50 has been divided into four categories, namely:—

R.R. 50 ... Sand and chill castings for general purposes.
R.R. 53 ... Die cast piston alloy.
R.R. 56 ... Forging alloy for general purposes.
R.R. 59 ... Forged piston alloy.

For cylinder heads, pistons and connecting rods, which are subjected to excessive temperatures and where lightness is desirable, R.R. 59, 56 and "Y" alloys are the recommended materials, the former being particularly suitable for forged cylinder heads on account of their strength and high conductivity. For parts not possible for forging, R.R. 53 casting material is available.

High Duty Alloys, Ltd., issue valuable data sheets to assist the designer and constructor of engines. Data Sheet No. 13 gives the physical properties of R.R. alloys compared with other wrought alloys at high temperatures, and No. 16 shows the physical properties of the alloys after annealing or taking up to various temperatures and allowing to cool down again to normal temperature before testing. The tests from which the data were obtained demonstrate the suitability of the R.R. wrought alloys for uses at high temperatures and their property of retaining strength on cooling again to normal temperature. A comparison of steel and aluminium alloy Hiduminium R.R. 56 beams is given on Sheet No. 12, and No. 13 discourses on the alloys for elevated temperatures and gives charts revealing a comparative effect of temperature on the hardness of R.R. 56 and 59 forged heat-treated bar, and also a comparative effect of temperature on the tensile strength of the two.

Load extension curves of the Hiduminium R.R. Alloys compared with Mild Steel 0.27% C., 0.6% Mn., Brinell 220 and other light Alloys.



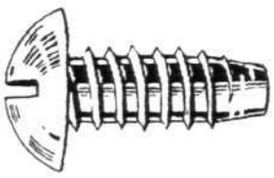
A MARCONI APPOINTMENT

AIR COMMODORE L. F. BLANDY, C.B., D.S.O., formerly head of the Signals Branch of the Air Ministry, has been appointed Deputy General Manager of Marconi's Wireless Telegraph Co., Ltd.

Air Comm. Blandy joined the Marconi Company in 1928, and during the last three years has been engaged on important missions abroad on behalf of the company, for which his previous experience particularly fitted him. He was responsible for building up the wireless organisation of the post-war Air Force, and also the ground wireless organisation for British Civil Aviation.

JOHN HAMILTON'S ADDRESS

JOHN HAMILTON, LTD., the publishers of so many flying books, have recently moved to more commodious premises. Their new address is 32, Bloomsbury Street, W.C.1, and their telephone number remains as before, Museum 4537.



SELF-TAPPING SCREWS

BUCK & HICKMAN, LTD., of 2, Whitechapel Road, E.1, are the distributors in England for Parker-Kalon hardened self-tapping screws. These are offered as a quick and cheap method of joining sheet metal and making fastenings on to it from any gauge between 28 and 6. They cut a thread in the metal as they are screwed in, thus eliminating the cost of tapping, and are also satisfactory when the metal is too light to tap in the normal way. Due to the fact that they cut their own thread, they are also said to be much securer under vibration than a normal screw. For assembling small aluminium castings or articles made of Bakelite, hard rubber, fibre, and similar materials, these screws are equally useful.

THE ROYAL AIR FORCE

London Gazette, January 12, 1932.

General Duties Branch.

Lt. Cmdr. T. O. Bulteel, R.N., is re-attached to R.A.F., as Flight Lieutenant with effect from Jan. 1, and with seny. of Jan. 1, 1929.

The following Pilot Officers on probation are confirmed in rank :—P. E. Drew (Nov. 13, 1931); H. L. Andrews (Dec. 22, 1931); G. L. C. Jenkins, N. P. Samuels (Dec. 29, 1931). The following Pilot Officers are promoted to rank of Flying Officer :—R. J. W. Barnett, G. M. Williams (Oct. 13, 1931); D. G. Morris (Dec. 27, 1931). Flying Officer C. R. Clarke takes rank and precedence as if his appointment as Flying Officer bore date Nov. 2, 1929. Reduction takes effect from Dec. 24, 1931. Squadron Leader L. G. S. Payne, M.C., A.F.C., is restored to full pay, from half pay (Dec. 28, 1931).

The following are placed on half-pay list, scale A :—Squadron Leader P. F. Fullard, D.S.O., M.C., A.F.C. (Jan. 10): Flying Officer K. S. Brake (Jan. 6). The following are placed on half pay list, scale B :—Wing Commander H. S. Powell, M.C. (Jan. 1); Squadron Leader E. I. Bussell (Jan. 6).

Flying Officer A. Wall is transferred to Stores Branch on probation (Jan. 8).

The following cease to be attached to R.A.F. on return to Naval duty :—Lt. J. W. Hale, R.N., Flying Officer, R.A.F. (Jan. 1); Lt. H. C. Ranald, R.N., Flying Officer, R.A.F. (Jan. 4).

Stores Branch

Squadron Leader F. Petch, O.B.E., is placed on retired list (Jan. 8).

ROYAL AIR FORCE RESERVE

General Duties Branch

The following Flying Officers relinquish their commns. on completion of service :—H. W. Roberts (Sept. 18, 1931); W. Parkinson (Dec. 30, 1931).

AUXILIARY AIR FORCE

General Duties Branch

No. 604 (COUNTY OF MIDDLESEX) (BOMBER) SQUADRON.—Pilot Officer R. Smallman-Tew is promoted to rank of Flying Officer (Dec. 21, 1931).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified :—

General Duties Branch

Group Captains: D. C. S. Evill, D.S.C., A.F.C., to R.A.F. Staff College, Andover, for duty as Instructor, 1.1.32. J. E. A. Baldwin, D.S.O., O.B.E., A.D.C. to H.Q., Fighting Area, Uxbridge, for Air Staff (Training) Duties, 1.1.32. H. L. Reilly, D.S.O., to Aeroplane and Armament Experimental Estab., Martlesham Heath, pending taking over command, 7.1.32.

Wing Commanders: W. A. McClaughry, D.S.O., M.C., D.F.C., to Air Ministry (D.O.I.), for Air Staff Duties, 1.1.32. G. B. A. Baker, M.C., to R.A.F. Base, Gosport, for Engineer Duties, 1.1.32. L. H. Slatter, O.B.E., D.S.C., D.F.C., to R.A.F. Depot, Uxbridge, and attached to H.M.S. *Courageous* for temporary duty, 3.1.32. A. H. Orlebar, A.F.C., to No. 1 Air Defence Group H.Q., for Air Staff Duties, 2.1.32. P. Babington, M.C., A.F.C., to R.A.F. College, Cranwell, for Flying (Assist. Commandant) Duties, 27.12.31.

Stores Branch

Squadron Leaders: P. M. Brambleby, to No. 1 Stores Depot, Kidbrooke, 1.1.32. A. E. Sutton-Jones, to H.Q., Air Defence of Gt. Britain, Uxbridge, 19.12.31.

Flight Lieutenants: L. T. Sanderson, to Air Ministry (D. of E.), 22.12.31. E. W. Lawrence, to R.A.F. Depot, Uxbridge, 11.12.31.

Flying Officers: E. H. Walker, to No. 4 Flying Training School, Abu Sueir, Egypt, 21.12.31. A. E. Evans, D.F.C., to Air Armament School, Eastchurch, 11.1.32. E. G. M. Charleston, to R.A.F. Depot, Uxbridge, 21.12.31.

Accountant Branch

Flight Lieutenants: R. W. Collinson, to R.A.F. Depot, Uxbridge, 11.12.31. V. G. A. Bennett, to Air Armament School, Eastchurch, 11.1.32.

Flying Officers: K. E. Holmes, to Station H.Q., Duxford, 28.12.31. G. L. Dook, to R.A.F. Depot, Uxbridge, 26.11.31.

Medical Branch

Air Commodore: H. V. Wells, C.B.E., K.H.P., to H.Q., Air Defence of Gt. Britain, Uxbridge, for duty as Principal Med. Officer, 4.1.32.

Group Captain H. W. Scott, to H.Q., Inland Area, Stanmore, for duty as Principal Med. Officer, 4.1.32.

Wing Commander F. N. D. Smartt, to H.Q., Wessex Bombing Area, Andover, 18.1.32.

Squadron Leaders: F. J. Murphy, to Aircraft Park, Lahore, India, 20.11.31. C. A. Lindup, to No. 4 Flying Training School, Abu Sueir, Egypt, 6.12.31. E. C. K. H. Foreman, to R.A.F. Base, Malta, 6.12.31. T. McClurkin, to R.A.F. Depot, Uxbridge, 1.12.31.

Flight Lieutenants: A. A. Townsend, to No. 1 (Indian Wing) Station, Kohat, 26.11.31. C. S. Strachan, to No. 28 Sqdn., Ambala, India, 30.11.31.

Dental Branch

Flying Officer P. J. C. Keane, to Med. Training Depot, Halton, on appointment to a non-permanent commn., 4.1.32.

NAVAL APPOINTMENT

The following appointment has been made by the Admiralty :—LIEUT. (F./O., R.A.F.).—I. M. MARTINEAU, to *Valiant* (Jan. 12).

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ROYAL AIR FORCE SHORT SERVICE COMMISSIONS

Extension of Period of Service

THE Air Ministry announces that as from April 1, 1932, short service commissions in the Royal Air Force will be granted for a period of six years on the active list (instead of five as at present) followed by four years in the reserve. Since the first year is spent in training as a pilot, this scheme will allow of five years' employment in a fighting unit and the Air Force will gain in efficiency by the increased experience of its short service officers.

The rank of Pilot Officer will be subdivided and short service officers on entry will be commissioned as "Acting Pilot Officers" on a standard rate of pay of 13s. per day (amounting to 11s. 6d. per day at present current rates), and will be promoted to Pilot Officer on a standard rate of pay of 16s. (present current rate 14s. 2d.) after a period of 12 months' approved service. The expenses of mess life in the Air Force are strictly regulated, so that officers, even in the lowest ranks, shall be able to live on their pay without difficulty, and the Air Ministry is satisfied that at the new rate applicable to short service officers during the year of initial training they will be able to take their full and proper share in the social life of their units.

Officers entered under this scheme will be paid a gratuity of £500 on transfer to the reserve on completion of their six years of active list service as compared with the gratuity of £375 payable at present on completion of five years' service. Officers selected for medium service from short service, *i.e.*, for a further five years on the active list, will earn £1,000 gratuity for the complete term of service as at present.

The slightly reduced number of officers required for short service under this scheme will normally permit of a higher percentage being selected for medium service and also for retention on permanent commissions for a life career in the Air Force.

As recently announced, the upper age limit for entry on a short service commission is now 22, *i.e.*, candidates must not have passed their 22nd birthday; the lower age limit is 18. With this lower age of entry, officers when transferred to the reserve will not be older, and may well be younger, under the six-year scheme now to be adopted than has been the case in the past under the five-year scheme; the additional year should, therefore, give rise to no special difficulty in obtaining civil employment on leaving the Service. They will as heretofore have the assistance in doing so of the Royal Air Force Officers' Employment Association if they so desire.

Foreign Officers with Royal Air Force Units

FLIGHT-LIEUTENANTS C. POTAMIANOS and C. PLATSIS, of the Greek Air Force, who were attached to the Central Flying School on 29/9/31, to undergo the Flying Instructor's Course, have been attached to the Royal Air Force Station, Boscombe Down, to study the work and organisation, and for a course of general instruction, for 3 months from 4/1/32.

Royal Air Force. Award of Prize Cadetships

THE Air Ministry announces :—The Air Council have awarded Prize Cadetships, each of the value of £105 per annum for two years, to the following successful candidates at the examination held in November, 1931, for entry into the Royal Air Force College, Cranwell :—

L. B. B. King, Dulwich College (as a King's Cadet he is granted Titular Distinction only).
J. N. Knowles, King George V School, Southport.
D. E. B. Wheeler, King's School, Canterbury.
M. Dawnay, Eton College.
D. P. Hanafin, Beaumont College, Old Windsor.
T. R. Manson, Haileybury College.
E. C. Hardin, Plymouth College.

Accountant Officers, R.A.F., Competition

THE Air Ministry states that in the circumstances of the present time it will not be possible to announce any vacancies for commissions in the Accountant Branch of the R.A.F. in 1932. It is regretted that it will, therefore, be necessary to postpone till 1933 the next competition for entry into that Branch.

Grant of Permanent Commissions to Short Service Officers (Medical Branch)

THE undermentioned medical officers have been accepted for permanent commissions, subject to physical fitness :—

Flight Lieutenants : Andrew Sheridan Burns, M.B., Ch.B. Hugh Cuthbert Sutcliffe Pimblett, M.B., B.S. Jeremiah Joseph Corcoran, M.B., B.Ch.

Transfer of Administration

THE administration of the following R.A.F. units will be transferred from Headquarters, Coastal Area, to Headquarters, No. 1 Air Defence Group, with effect from January 18, 1932 :—

(i) Central Medical Establishment. (Under Air Ministry (D.M.S.) for technical administration (medical).)
(ii) (*a*) Inspector of Recruiting. (Directly under Air Ministry for technical administration.)
(*b*) R.A.F. Recruiting Depot.

R.A.F. SPORT.

Rugby Football.

THE Police beat the R.A.F. at Thames Ditton on Saturday, January 9, by 2 dropped goals and 5 tries (23 points), to 2 tries (6 points). The R.A.F. tries were scored by Flt.-Lt. G. R. Beamish and P./O. Manton. Flt.-Lt. Hodder was injured and had to leave the field. The R.A.F. team was :—F./O. G. P. Longfield, back; P./O. G. A. L. Manton, Flt.-Lt. F. S. Hodder, P./O. P. B. Coote, and P./O. N. C. Walker, three-quarter backs; A.C.I. N. G. Williams and A.C.I. G./V. Lansberry, half-backs; L.A.C. A. E. Simmons, L.A.C. W. Reynolds, F./O. C. Beamish, F./O. H. A. Constantine, F./O. G. E. S. Williams, P./O. A. L. Holland, Flt.-Lt. G. R. Beamish, and Flt.-Lt. B. V. Reynolds, forwards.

A "D.H." BALL

FOR the third year the de Havilland Aeronautical Technical School held, at the Portman Rooms, their annual Ball, on January 15. It was generally recognised that this dance was the most successful yet held by the School. Col. F. C. Shelmerdine, Director of Civil Aviation, was there, together with Mrs. Shelmerdine, and among many others well known in aviation who certainly appeared to be enjoying the evening were Col. H. W. Outram, Director of the Aeronautical Inspection Directorate, Capt. and Mrs. de Havilland and Mr. and Mrs. C. C. Walker.

There were several novelty dances for which prizes were given, and a race between two "aircraft," for the design of which the School was responsible. It is to be hoped that they have other aircraft upon which to carry out their practice work, for all that was left of these two weird and wonderful machines at the end of the evening was but a litter wherewith to light the fire in the morning. The first of these was the "Tipsy Moth," manned by Messrs. Buckingham and Broad. It was evidently not as economical as the new "Swallow Moth" is said to be, for ten barrels per hour was its announced consumption (although we did hear a remark to the effect that pilots with such a small consumption should be ashamed to fly at all!) Mr. Buckingham was apparently in charge, and we thought he sought undue advantage when he hastily pegged several pairs of silk stockings to his flying wires, thereby increasing his sail area considerably, though he probably impaired his latent stability. The "Autofly," the other machine, was manned by Capts. Cordes and Hope. This was a warlike version of a sort of "Helicautogiro," for the bomb racks, slung underneath its low wing, carried deadly-looking missiles whose fermented contents the pilots had already found satisfying to their palate, while a large label on the tail admonished the owners to use only Bass No. 1. Capt. Cordes had evidently not read one of the latest Air Ministry Notices to Ground Engineers, for we noticed at least two varieties of slippers tied between his two rudders. The race took the form of one lap, the length of the ballroom and back again, after which both the machines and pilots had to re-fuel. The fuel to be used for the "Autofly" was specified in large letters on the fuselage, but we noticed that these instructions were also copied by the crew of the "Tipsy Moth." When this fuel was completely consumed, another lap of the course was flown. Neither of the pilots in charge appeared to have complete control of their machine, and, in fact, before the end they both looked as if they had been drawn through a blackthorn hedge, backwards. However, amongst the cheers of the students, the "Autofly" was eventually acclaimed as the winner.

Some little time later Mrs. Eadon, the wife of the Principal of the School, distributed the prizes for the various novelty dances and for the race of the "Air Aces." These took the form of exceptionally fine pieces of silver and glass, while the runners-up for the race, being adjudged to have lacked a knowledge of the means by which pilots find their way about the country, were presented with "A Manual of Air Pilotage" each. There was evidence that the School is extremely popular with large numbers of people outside England as well as those inside, for almost every second man we saw seemed to be an Indian. This fact was really somewhat ironical, as the Indian Government have seen fit to do their best in stamping out any interest in aviation in their country.

We cannot close without a word of congratulation to Mr. Eadon for the excellent way in which he had organised everything. Incidentally, this School is filling a long-felt want amongst those who wish to get a start in aviation, and from its inception has, we understand, never had any difficulty in procuring a full complement of students.

Information has just come to hand that two and a-half months ago the students of the de Havilland Technical School commenced work on a Gipsy One Moth. Since that time the students, working to A.I.D. requirements, have built up what is now a practically finished machine which they intend using on their own Flying Club. During this period the Technical School workshop has been divided up into different departments, such as woodwork, welding, fabric covering, engine assembly and stores.

Test flights of this machine are expected to take place in about three weeks' time.

PUBLICATIONS RECEIVED

Aeronautical Research Committee Reports and Memoranda: No. 1,401 (Ae. 522—T. 3,132), *Motion of H.M.A. R.101 Under Certain Assumed Conditions.* By D. H. Williams and A. R. Collar. May, 1931. Price 1s. 3d. net. No. 1,404 (Ae. 525—Spin 62), *Free-Flight Spinning Experiments with Several Models.* By A. V. Stephens. April, 1931. Price 1s. net. No. 1,405 (Ae. 526—T. 3,108), *The R.A.E. Automatic Observer, Mark IA.* By D. A. Jones. January, 1931. Price 1s. net. No. 1,407 (Ae. 528—T. 3,045A), *Note on Change of Wind with Height.* By L. W. Bryant. March, 1931. Price 6d. net. No. 1,409 (Ae. 530—T. 3,135), *The Drag of Small Streamline Bodies.* By E. Ower and C. T. Hutton. June, 1931. Price 6d. net. London: H.M. Stationery Office, W.C.2.

The South American Handbook, 1932. Trade and Travel Publications, Ltd., 14, Leadenhall Street, London, E.C.3. Price 2s. 6d. net. Post free 3s.

Nickel: The Mechanical Properties of Nickel Alloy Steels. The Bureau of Information on Nickel, The Mond Nickel Co., Ltd., Imperial Chemical House, Millbank, London, S.W.1.

"Eagle" Aircraft Cameras and Equipment. Williamson Manufacturing Co., Ltd., Litchfield Gardens, Willesden Green, London, N.W.10.

NEW COMPANIES REGISTERED

DOCKS MOTOR ENGINEERING COMPANY, LTD., 76, Cleethorpe Road, Grimsby.—Capital £2,000, in £1 shares. Manufacturers of and dealers in motor cars, cycles, aeroplanes, &c., to promote race meetings and speed and trial tests for aviators, motorists, &c. Directors: F. W. Gough, Royal Hotel, Grimsby (director Bituminous Compositions, Ltd.); E. Sutcliffe, Stewton House, Louth (director Humber Graving Dock, Ltd.).

INTERNATIONAL MODEL AIRCRAFT, LTD., 298, Fulham Road S.W.10.—Capital £17,000, in 15,000 redeemable 7 per cent. cumulative preference shares of £1 and 40,000 ordinary shares of 1s. each. Manufacturers of and dealers in toys, models and mechanical devices of all kinds, including model aircraft and accessories.

THE SCOTTISH AIRWAYS, LTD., 122, High Street, Falkirk (registered in Edinburgh). Capital £20,000, in £1 shares. The objects are to construct, equip and conduct an aerodrome and flying school near Falkirk, Stirlingshire. Directors: R. H. Salveson, Avondale, Polemont, shipowner; C. A. Salveson, Wallacerig, Polemont, shipowner; T. Harvey, Wadingshall, Polemont, retired shipbuilder; S. H. Hardasyde, 9, Marchmont Street, Edinburgh, engineer; H. D. Matthews, 26, Great North Road, Newcastle-on-Tyne, engineer.

HOVERPLANE COMPANY, LIMITED.—Capital £1,250, in £1 (250 7½ per cent. non-cumulative preference and 1,000 ordinary). Acquiring patents or inventions relating to the manufacture, application or use of flying machines or any apparatus used in connection therewith, and in particular to acquire patents, licences and all or any interest and rights in the Whitlet Hoverplane or Captiplane, and the W. L. Hoverplane Synd., including the rights in the U.K. and the Isle of Man and elsewhere. The subscribers are: J. R. S. Whiting, "Brown Eaves," Beacons Hill, Farnham, engineer; O. K. Whiting, 273, Regent Street, W.1, manufacturer. Solicitors: Tatham, Oblein & Nash, 11, Queen Victoria Street, E.C.4.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.).

Applied for in 1931

(*Published January 21, 1932*)

4,854. R. SCHALLERT. Screw propellers. (363,893).
4,896. PACKARD MOTOR CAR CO. Fuel injection in oil engines. (363,891).

FLIGHT, *The Aircraft Engineer and Airships.*
36, GREAT QUEEN STREET, KINGSWAY, W.C.2.
Telephone (2 lines): Holborn, 3211.
Holborn, 1884.
Telegraphic address: Truditur, Westcent, London.

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